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*Illustrated.

A combination of the splendid showing which the Baltimore & Ohio has been making and an improvement in the railroad bond

A Contrast in State Regulation

market made it possible for Daniel Willard, president of the Baltimore & Ohio, recently to sell \$60,000,000 of his company's bonds at a price that was advantageous to the railroad. This provided the company with \$40,000,000 to refund notes which will fall due in the near future and new capital for additions and betterment work. The negotiations for the sale of these notes were carried on between Mr. Willard and the bankers rapidly, as this kind of negotiation so often is. Mr. Willard found on a certain day that he could get his price for the bonds. The deal was closed. If he had stopped to get the consent of the state public service commissions, which was necessary before the bonds could be issued, he would in all probability have lost his market. Another set of negotiations would have had to be begun and the price might have been by no means so advantageous for the company. Mr. Willard went personally before the Maryland Public Service Commission and the Ohio Public Service Commission and explained the situation to them. Both commissions gave their approval to the issue. There was, of course, no reason why they should not. However, the spirit in which the approval was given was highly praiseworthy. Co-operation of this kind from state commissions is rare and when it occurs deserves notice and commendation. Contrast this with the attitude of the Missouri commission in the Wabash reorganization. Security holders of the Wabash have accepted very heavy sacrifices. The new company has been formed on a sound and conservative basis and it is of the utmost interest to the territory served by the road as well as to its security holders that the new company should have every opportunity to make good. The secretary of state of Missouri has refused to give permission to the road to operate at all for a reason, which if valid, is entirely technical and trivial. This is the danger that is continually inherent in the control of interstate railways by the states.

Window dressing is a term applied to a good showing made by a corporation preparatory to the sale of an issue of securities

An Unusual Bond Offering

to the public. Probably a majority of American railway presidents have been under the necessity of window dressing at some time in their lives in order to sell through their bankers a large new issue of securities. When a good showing in net is made at the expense of maintenance appropriations, or when dividends are paid that are not justifiable in order to strengthen the market for the company's securities, the effect of window dressing is objectionable. When it is simply a marshaling of the facts it is part of the art of salesmanship which every seller has to resort to to some extent. The Seaboard Air Line has sold to a syndicate headed by the Guaranty Trust Company and the National City Bank, both of New York, \$22,894,000 first and consolidated mortgage, series A, 6 per cent bonds of September 1, 1915-1945. This is the first issue of bonds under the new mortgage which is to provide for the comprehensive future financing of the property. The bonds are offered to the public at 99½. The annual report of the Seaboard for the fiscal year ended June 30, 1915, was recently reviewed in these columns. Properly interpreted, the report was a remarkably good demonstration of what the property could be made to earn even in a year of wholly extraordinary depression in every line of industry in the South. Taken superficially, however, it showed a great loss of revenue as compared with the previous year. The railroad bond market is now good. In the fiscal year ending June 30, 1916, there is every prospect that the Seaboard will make a showing which will contrast in a strikingly favorable way with that made in 1915. The fact that the bankers were willing to undertake the sale of a large issue of new bonds without window

dressings of any kind in the showing made by the railroad company, when this showing was superficially not favorable, speaks a confidence which has not in the past generally been shown by bankers in the intelligence of investors. The underlying conditions of the Seaboard Air Line are sound, and by making an offering of bonds now, the bankers are relying on investors to make more than a superficial study of the company's showing and to appreciate what these underlying conditions really are.

President Ripley of the Santa Fe has written a strong letter advocating the creation of a permanent tariff commission. The

**For a Non-
Partisan Tariff
Commission**

railways do not sell anything that is directly affected by the tariff; but their prosperity is greatly, although indirectly, affected by tariff-making. Every important revision of the tariff compels a general readjustment in business affairs; and such readjustments almost always cause periods of depression which seriously reduce the traffic moved and curtail railway earnings. The railways, therefore, have as much reason for wanting to see tariff-making taken out of politics as any other large business interest. The reasons for turning the framing of tariff schedules over to a permanent, expert commission are as numerous and convincing as the reasons for delegating the regulation of railway rates to such a commission. It is true that the Interstate Commerce Commission can actually fix rates, while a tariff commission could only recommend to Congress the schedules it ought to adopt; but a permanent commission could at least do much better than committees of Congress the preliminary work of investigating conditions and framing the tentative schedules. The Tariff Commission League, which recently has been organized, deserves, we believe, the support of business men in all lines, including railway men.

WORK FOR A COMMISSION ON REGULATION

THE recommendation of President Wilson for the creation of a federal commission to investigate fully the subject of railroad regulation shows that the President is alive to the unsatisfactoriness of the present situation. Regulation has come to stay. It will never be made less firm and comprehensive than it is now. But it can and must be made more consistent, scientific and fair. Its past and present deficiencies are largely due to the fact that the legislation providing for it has been adopted by a large number of different bodies piecemeal and without any co-operation; that the legislation usually has been enacted without any real investigation, and that its administration often has been neither consistent, expert nor fair. The experiment of effective regulation will soon have been carried on for 10 years. In view of the large mileage of railways in the hands of receivers and of the fact that new construction is now at the lowest ebb for at least 50 years, the results cannot be regarded as entirely satisfactory. The end of the first decade of effective regulation will be a good time to pause, take stock, and, having taken stock, adopt measures for a more constructive, enlightened and salutary policy.

If a commission, such as that suggested by the President, is created it should have no difficulty in selecting the subjects to which it should devote most of its attention. One of these would naturally be the relations of state and federal regulation. When state and federal regulation conflict one of them must go down. Under present conditions, especially in the regulation of rates, it is usually federal regulation which goes down. But, obviously, the one which should give way is state regulation. The constitutional authority of the federal government over interstate commerce is paramount to that of the states over state commerce. The welfare of the nation is paramount to the selfish interests of the people of any state. Therefore, our system of regulation should be so altered that no state regulation

which directly or indirectly conflicts or interferes with regulation by the federal authorities will be permitted. The states will, of course, retain control over their local public utilities. Probably they will be allowed to continue to regulate railway matters of merely local consequence. But a commission which thoroughly investigated the situation could hardly fail to conclude that the existing relations between state and federal regulation are unwholesome in their effect upon both the railways and the public, and should be radically changed.

The proposed commission would naturally investigate the subject of suspensions of advances in rates by the Interstate Commerce Commission. It is extremely doubtful whether the authority to suspend should ever have been given to the commission. Probably it cannot now be taken away, but the length of the periods during which rates are kept under suspension should be reduced. The law, as it now stands, does injustice to the railways. If an advance in rates goes into effect and is subsequently found to be unreasonable the shippers and travelers affected can secure reparation. But if an advance in rates is suspended and subsequently found to be reasonable the railways have no means of obtaining redress. There have been numerous cases where the Interstate Commerce Commission has suspended rates for long periods and finally found them reasonable. In these cases taken together the losses unjustly inflicted upon the railroads in the United States have amounted to millions of dollars. The law and the procedure regarding the suspension of rates need to be reformed.

While this is being done the fact should be recognized that rates may be made too low as well as too high, and that, therefore, the Interstate Commerce Commission should be given authority to suspend reductions and fix minimum rates, in addition to its present authority to suspend advances and fix maximum rates.

The proposed commission would naturally go into the subject of regulation of the issuance of securities. The *Railway Age Gazette* believes that the Interstate Commerce Commission should be given this authority, but only on condition that it will thereby be entirely taken from the states. Regulation of the issuance of securities is too delicate a function to be performed by 48 different state commissions, and the situation certainly will not be improved by having it performed by both the state and the interstate commissions. If it is to be performed at all it should be by the Interstate Commerce Commission alone.

The proposed commission would naturally give great consideration to the necessity for a reorganization of the Interstate Commerce Commission. One of the most important steps needed is a separation of the legislative, the judicial and the prosecuting functions now united in the commission. The salaries of its members should be increased, their terms should also be lengthened, and either their functions should be so changed as to lighten their work or the number of commissioners should be increased.

One of the most important and difficult problems now confronting the country is presented by the relations between the railways and their employees. At this moment the four strongest of the railway brotherhoods are co-operating in a movement to secure a maximum working day of eight hours without any reduction in pay. This movement follows others which in the last decade have caused increases in wages aggregating over \$300,000,000 a year. The employees are publicly announcing that they will not arbitrate their new demands, but will strike and tie up all the roads in the country unless they are granted. The public would be very seriously affected by such action. Does it intend to take no step to prevent it? The proposed commission would find plenty of work ready to its hand—work of such a character that the ablest men in the country will be none too big for it. Senator Newlands, who advocates President Wilson's policy in a general way, seems to favor the creation of a joint committee of Congress to deal with the matter. Doubtless the commission should include some members of Congress. Perhaps, also, it should include some members of the Interstate Commerce

Commission. But it ought also to include some representatives of the railroads and other business interests. It should be a commission with a personnel that would deserve as much respect and confidence as did the personnels of the Railroad Securities Commission, the National Monetary Commission and the commission that arbitrated the controversy between the eastern railways and their engineers and firemen in 1912.

TO PROMOTE SAFETY AT HIGHWAY CROSSINGS

THE railroads of the United States, through the American Railway Association, have undertaken a campaign for the prevention of accidents at highway crossings. President Mudge, on the recommendation of the executive committee, has appointed a special committee, consisting of seven railroad officers representing the railroads of the country territorially, to consider the entire question.

The members of the committee are: James A. McCrea, general manager, Long Island, chairman; J. Q. Van Winkle, assistant to general manager, Cleveland, Cincinnati, Chicago & St. Louis; C. L. Bardo, general manager, New York, New Haven & Hartford; L. E. Jeffries, general attorney, Southern; Howard Elliott, inspector of transportation, San Pedro, Los Angeles & Salt Lake; W. J. Towne, assistant general manager, Chicago & North Western, and W. R. Scott, vice-president and general manager, Southern Pacific.

This committee will present recommendations, after a thorough investigation, for action to bring about a reduction of one of the most numerous classes of railway casualties, and one which is rapidly increasing in spite of the many millions that have been expended by the railroads for the elimination of grade crossings.

The importance of the problem is indicated by the fact that in the last 10 years for which the statistics are available the Interstate Commerce Commission has reported a total of 9,479 persons killed and 21,917 injured by being struck or run over by cars or locomotives at highway crossings. The figures by years are as follows, with those for 1910, when the Interstate Commerce Commission did not report them, estimated by taking the average of the figures for 1909 and 1911:

Year.	Killed.	Injured.
1905	837	1564
1906	926	1884
1907	933	1797
1908	832	1755
1909	773	1830
1910	882	2132
1911	992	2434
1912	1032	2506
1913	1125	3080
1914	1147	2935
Totals	9479	21917

These figures show an increase fairly consistent with the development of railway traffic, although the increase in the number of persons killed is less in proportion than the growth of the railway business, but since 1909 there has been a steady increase unaffected by the falling off in traffic in 1914. This is doubtless largely due to the increase in the use of automobiles, especially in the rural districts, and this phase of the situation will necessarily assume an important place in the committee's investigation.

Naturally, the chances for grade crossing accidents increase with the number of trains run, and the railroads by heavier trainloading have prevented the number of trains run from increasing in proportion to the traffic, thereby holding down the chances of grade crossing accidents. Nevertheless, many legislators during the past year voted for bills to require the railroad companies to run shorter, and consequently more trains, because the labor leaders told them that it was in the interest of safety.

The standard remedy of the public authorities for crossing accidents is elevation or depression of the tracks—if the railroads can be made to stand the expense. If there is a chance that the community may be required to share the cost of an im-

provement made for its benefit, the zeal of the public officials for grade separation frequently wanes. The separation of grades as rapidly as practicable is much to be desired, but at an average cost of probably \$50,000 per crossing even the most affluent railroad corporation can afford to eliminate only a small part of its grade crossings. Complete separation of grades would cost most roads more than they are worth and in many places the expense is so great as to raise the question whether the same amount of money would not bring about a greater reduction of accidents if expended in other ways.

In Chicago the roads have been required to spend about \$80,000,000 to date for the elevation of their tracks, with practically the sole object of reducing the danger of accidents at crossings, and the work is hardly more than half done. As was shown in a recent issue of this paper the number of people killed by trains at street crossings in Chicago has been reduced from 99 in 1905 to 31 in 1914, while the number of people killed by vehicles in the city streets has increased from 34 to 143, and in 1914 100 other persons were killed by trains at points not on the city streets, practically all of them while trespassing and many of them while trespassing on the elevated tracks of the railways.

A common reply of public officials to the objections of railroads to grade separation work because of its cost is that the improvement will save the roads large sums they would otherwise have to pay for damages. The amount thus saved will not go far toward paying the interest on the expenditure involved. If, however, the public authorities would co-operate with the roads to eliminate some of the accidents for which the victims themselves are chiefly responsible they might cause a saving that would contribute a considerable amount toward the cost of grade separation.

Mr. McCrea, the chairman of the American Railway Association committee, is especially qualified for the position by reason of experience gained by him in prosecuting a vigorous campaign to instill safety first ideas into the motorists of Long Island. The committee can undoubtedly accomplish some results well worth while by working along the lines followed by the Long Island and some other roads that have made special efforts to reduce crossing accidents. The Long Island, after having spent \$15,000,000 for the elimination of grade crossings, still has a large number, and had experienced so much trouble with reckless automobile drivers that it has installed signs as large as 50 ft. by 10 ft. to warn drivers of the necessity for carefulness in approaching some of its crossings. It has even found it necessary to install some crossing gates the size of telegraph poles because automobilists persisted in breaking through ordinary gates when set against the highway traffic on account of the approach of a train.

Many roads have placed large warning signs or signals at approaches to their crossings, but even where protective devices are in service they depend for their efficiency largely on the attitude of the public using the highways. Enginemen are trained to be careful and are impressed with the importance of sounding whistle signals at crossings, but many automobilists approach railroad tracks without any effort to ascertain whether it is safe to cross.

To what a large extent highway crossing accidents are due to carelessness is demonstrated by observations, made by the Southern Pacific, of the actions of the drivers of 17,021 motor vehicles on approaching railroad crossings in a number of widely separated localities. Of the total, 11,836 drivers, or 69½ per cent, looked neither to right nor left before crossing the tracks; 2.7 per cent looked only one way and only 27.8 per cent looked in both directions, while 3,301, or 19.3 per cent, ran over the crossing at a reckless rate of speed, and only 35 stopped before crossing. Of 4,889 drivers of teams, 39.4 per cent looked in neither direction, 8.6 per cent looked only one way and only 52 per cent looked in both directions. Similar observations taken a year later at the same places, after the road had given a great deal of publicity to its efforts to reduce this kind of acci-

dents and had appealed for the co-operation of local authorities and automobile clubs, showed a considerable improvement.

The Baltimore & Ohio has had similar observations made, and at Uniontown, Pa., on September 12, when 729 automobiles crossed the tracks at one street in 12 hours only 28 stopped to ascertain whether or not a train was approaching, and 505 were not even slowed down. There were but 135 drivers who looked in both directions, while 542 did not look at all before crossing.

As the country develops it will be necessary for the railways to continue to eliminate grade crossings as rapidly as they can, and the increases of population and industry that make such expenditures necessary should naturally tend to so increase earnings as to enable the roads to meet them, but meanwhile a great deal can be accomplished to make conditions safer if the roads can secure the interest and co-operation of the public and of its representatives.

HIGHER PASSENGER FARES APPROVED

THE decision of the Interstate Commerce Commission allowing increases in western passenger fares is one of the most favorable the roads have ever received at its hands. This was to be expected from its previous utterances as well as from the evidence in the case, but it is gratifying to find that the commission has so clearly sustained the position taken for a long time by railroad men as well as by most others who have studied the subject.

The commission has not given the roads all that they asked for, but it has come near to doing so. In Illinois, Wisconsin, the upper peninsula of Michigan, Minnesota, Iowa, Nebraska, Missouri north of the Missouri river, and Kansas on and north of the main line of the Union Pacific, where the tariffs filed by the roads proposed a basis of 2.5 cents a mile, the commission authorizes a basis of 2.4 cents; in Missouri south of the river and in Kansas south of the Union Pacific, where the roads had asked for 3 cents a mile the commission authorizes 2.6 cents.

Proposed increases in fares from the territory described to the east, which may be arrived at by combination of the rates authorized and the existing fares in eastern territory, now on a basis of 2½ cents, are justified, but to points outside the territory directly involved on the main lines of the respondent carriers in California, Utah, Nevada, Colorado, Wyoming, Arizona, New Mexico, Arkansas, Oklahoma and Texas, the commission limits the proposed increases to the combination of the 2.4 and 2.6 cent basis and a basis of 2.5 cents in North and South Dakota, and a basis of 3 cents a mile west and south of the territory described.

However, the commission has approved the full advance asked on mileage books from 2 to 2¼ cents in the northern territory described and from 2 to 2½ cents in the southern territory.

There is nothing in the opinion to explain why the commission finds a rate of 2.4 or 2.6 cents reasonable and 2.5 and 3 cents too high; it simply states that the carriers have "failed to justify" the higher rates proposed. Nor is any reason given why lower rates are approved for the western states than were allowed in the east. The commission points out that "on all sides of the territory principally affected the standard fares are generally upon a higher level" and that in the territory to the east the population per square mile and per mile of railroad, as well as the density of passenger traffic "are notably greater" But while finding that "there is some justification for a lower basis of fares in this territory than in the states west and south thereof" it does not apply this remark to the eastern states, although using language from which it may be inferred that the various factors tending to reduce the average receipts per passenger mile in the east are considered as not conflicting with a higher standard rate in the east.

Many of the commission's findings of fact completely support the contentions long made by the railroads. For example, it says:

"All these influences (higher expenses and lower rates) have been reflected in the diminished rate of return per dollar of investment in the

railroad property of the railroads here affected. These railroads, like other industries, have felt the rising cost of living, to a certain extent due to an increased price of some of the articles necessarily required in the conduct of their business, but to a large extent due also to the increased wage paid to their employees and to increased taxes."

The commission finds that substantial improvements in passenger service have been made at large expense, that the conditions under which the passenger service is performed do not admit of economies in operation corresponding to all those that have been effected in the freight service, that the increased cost of service is entitled to consideration and that the passenger business in the territory affected is less profitable than the freight business.

With reference to statements regarding the alleged operation of a greater number of passenger trains between competitive points than the necessities of the public require, the commission calls attention to the fact that the intermediate territory must be considered. "Neither competition nor the unreasonable demands of the public," however, must be made the excuse for waste and extravagance in the passenger service.

As the official announcement that a rate higher than 2 cents a mile in the west is not unreasonable hardly brings much of a surprise, after the commission had allowed the eastern 2½ cent fares to go into effect last year without suspension, interest in the decision naturally turns at once to the effect it will have on intrastate rates. That the commission has also had this phase of the question in mind is indicated by the following significant paragraph in the opinion:

"This increased revenue which apparently should come from the passenger traffic should not, however, be altogether imposed upon the interstate traffic. Manifestly a person journeying by rail within the boundaries of a state cannot expect to travel at the expense, in any degree, of the interstate passenger. . . . The revenue of respondents from intrastate passenger traffic within these states is approximately 96 per cent of that from the interstate traffic. While we should permit reasonable interstate fares, we cannot sanction fares that are higher than are reasonable for the service performed because intrastate fares are alleged or shown to be unduly low."

Of the states included in the territory directly involved in the case, Wisconsin, Michigan, Illinois, Iowa, Missouri, Minnesota, Nebraska and Kansas now have 2-cent intrastate fares, and the interstate rates in effect are generally on a 2-cent basis. In North and South Dakota the general basis for both state and interstate fares is 2½ cents; Louisiana and Texas have 3-cent intrastate rates and the interstate rates through these states and Arkansas, Missouri and Oklahoma are generally 3 cents, the latter rate having been approved by the Interstate Commerce Commission in a previous decision.

In the face of these two decisions, approving rates ranging from 2.46 to 3 cents a mile for interstate fares it is difficult to see how the 2-cent fare states can maintain their present low rates. In Missouri the restriction to 2 cents, except for mileage books, will be removed by the recent decision of the state commission.

The railroads have been planning to use the Interstate Commerce Commission's decision as a lever to raise some of the state rates, but just what form the procedure will take will undoubtedly depend on the outcome of the case now pending before the commission on the complaint of the Business Men's League of St. Louis, asking the removal of the discrimination created by the interstate freight and passenger rates between Illinois points to St. Louis higher than the intrastate rates and fares between the same points and East St. Louis and other border points. If the interstate fare of \$7.50 from Chicago to St. Louis is reasonable the St. Louis man is certainly discriminated against by a fare of \$5.62 from Chicago to East St. Louis for a distance only four miles less.

Outside the territory directly affected the only states that have maximum 2-cent fares are Oklahoma, Indiana and Ohio; and in all these states the Interstate Commerce Commission already had permitted higher interstate fares to go into effect.

Annual Report of the Interstate Commerce Commission

Commission Recommends the Enlargement of Its Membership and Extension of Its Powers

The following is a very much condensed abstract of the report of the Interstate Commerce Commission, which was submitted by the commission to Congress on December 13. The report covers the period from November 1, 1914, to October 31, 1915. There were 6,500 informal complaints received during the year as compared with 7,880 in the previous year. There were 6,690 applications filed by the roads to make refunds, an increase as compared with the previous year of 1,176. The number of formal complaints filed during the year was 964, a decrease as compared with the previous year of 190. There were 902 cases decided and 205 dismissed, a total of 1,107 cases disposed of, comparing with 864 disposed of in the previous year. The decrease in the number of complaints filed during the year has been more than offset by the complex nature of the cases that have been presented. The rate structures between various communities are now more often the subject of complaint than was the case in earlier years.

The number of proceedings under the suspension of schedules, part of the act, was 199, a decrease of 4 as compared with the previous year. There were 210 cases disposed of, an increase of 51 as compared with the previous year. In 56 instances the tariffs were voluntarily withdrawn by the carrier; in 3 instances protests were withdrawn and suspension order vacated; in 1 instance reductions were made in the proposed rates and then suspension vacated; in 50 instances proposed changes were allowed; in 38 instances they were allowed in part; in 59 instances they were disallowed, and in 3 instances orders of suspension were vacated.

The commission refused to suspend schedules in respect to 368 cases, an increase of 157 as compared with the previous year. The commission's duty is to determine as fully as possible whether the proposed tariff schedule represents an appropriate exercise of the carrier's right to initiate rates or whether it appears to go beyond the legitimate exercise of this function.

[The principal investigations made by the commission have been covered in these columns at the time they were made public.]

THE FOURTH SECTION

There were 673 applications for a suspension by the commission of the long and short-haul clause, a decrease of 277 as compared with the preceding year. There were 822 orders entered, 260 of which were permanent and 562 were temporary. Since the opening of the Panama Canal, water carriers have materially reduced their rates, shortened the time of transportation and increased the frequency of sailings. There were 49 ships, with a capacity of 380,000 tons in service between the Atlantic and Pacific coast. The total tonnage from the Atlantic to the Pacific coast and Hawaiian Islands was 397,974 tons in 1911, 451,592 tons in 1912, 434,115 tons in 1913, and for the month of September, 1914, the tonnage was 77,915 tons, or more than twice the average monthly tonnage for the preceding year. The tonnage handled by water lines included a great deal originating in the interior. Thirty-two cars of cast iron pipe moved by rail from Birmingham, Ala., to New Orleans, La., and thence by water to the Pacific coast. Catsup moved from Rochester, N. Y., by rail to New York and thence by water to the Pacific coast. It was evident that the degree of competition between the rail carriers and water carriers was greatly increased and it was necessary for the rail lines to make material reductions in their rates if they expected to obtain any considerable percentage of the coast to coast traffic. The reductions extended to Pittsburgh, Chicago and Missouri river territory and the commission granted additional relief in respect to the rates on commodities included in schedule C, but in addition to this a second application has been filed with the commission for further modification of the orders relating to trans-continental rates.

RATE SCHEDULES

There were 149,449 tariff publications containing changes in rates filed. This is an increase of 418 over the previous 11 months. Complaints have been received of failure to post tariffs at stations at which freight and passengers are received, and it appearing that no uniform or adequate plan was being followed, an order was issued requiring the agent at every station to stamp on a new tariff the date received and to keep a record showing the date posted at the station. The rate work of the division of tariffs continues to increase, notwithstanding the fact that, due to the commission's regulations, tariff publications are far more understandable than heretofore. This increase is largely accounted for by the fact that during the last two years a great many changes in rates and fares have been made.

CLASSIFICATION OF FREIGHT

The Western classification committee has now been in continuous session for 21 months demonstrating the practicability of placing freight classification in the hands of a limited committee whose members represent no particular lines and are not interested in soliciting traffic. Progress has been made in getting state commissions to adopt western classification.

The official classification committee is to be reorganized along the lines on which the western committee is organized. At present it consists of 15 members who meet quarterly and whose recommendations are submitted to individual lines for approval. A permanent committee is to be appointed but, unlike the western committee, its action will not be final. The southern classification committee holds fewer meetings than either of the other committees.

A committee of the carriers has been working for several years to bring about uniformity of classification, and since this involves changes in ratings and rates on practically all articles moving under class rates, it must apparently come slowly, and after uniformity has been attained with regard to rules, packing requirements and minimum carload rates. The following table shows the uniformity as of October 20, 1915:

Total items in classification.	Uniform classification committee has passed—	classification committee has passed—	Uniform classification committee has written but not yet passed.		Uniform classification committee has not written.	
			Number.	Per cent.	Number.	Per cent.
Official classification	5,765	4,582	80.00	5.00	15.00	
Southern classification	4,780	4,181	87.50	3.50	9.00	
Western classification	6,917	5,291	76.50	5.00	18.00	

The commission has previously suggested that it be given authority to require uniformity in classification, which authority could be exercised so as to hasten the adoption of uniformity and at the same time do no harm to any interests.

EXPRESS COMPANIES

After one year's experience under the new rates for express companies ordered by the commission, effective February 1, 1914 the four principal companies doing 95 per cent of the express business filed a petition for a modification of the order, which petition if granted they estimate would increase their gross revenue 3.86 per cent. The number of shipments handled under the commission's rates increased 2,225,000, but gross transportation revenues decreased \$13,680,810. The modification sought the commission thought, would not result in unreasonable rates and was therefore granted, the new rates becoming effective September 1, 1915. A universal block system of express rates was not adopted because it would increase rates materially in

some sections and decrease express company revenues materially in other sections.

DIVISION OF INQUIRY

This division has to do with the investigation of seeming violations of the commerce act or the Elkins act. About 90 per cent of the matters investigated were disposed of without resort to the courts. There were 72 indictments, and the number of defendants is much greater than this, many indictments being against two or more defendants. Of these, 22 were against carriers or carriers' agents and 50 against passengers, shippers or other interested parties. During the year 48 cases were concluded. These included 31 cases in which pleas of guilty or *nolo contendere* were entered. In 7 cases verdicts of guilty were rendered and in 2 cases verdicts of not guilty. The principal court decisions have been summarized from time to time in the *Railway Age Gazette*. Various indictments were found against roads for granting to individuals favors or free passenger service. Several instances were discovered where large shippers were affiliated with carriers and were thus enabled to secure advantages from other shippers. A tendency to revise all leases at less than a fair rental in order to avoid granting concessions to shippers in this indirect way has been observed. Several prosecutions have arisen as a result of the failure of carriers to observe strictly their tariffs.

False billing of shipments by shippers has continued to require much attention. In misbilling cases it is common for shippers to plead guilty and thus escape with a smaller fine than would result if the case were contested. The courts, however, have recently imposed substantial fines in cases of this kind where the defendant admits his guilt. Thus, in an indictment of 20 counts brought against the Standard Brewing Company for false billing of a carload of beer a plea of guilty was entered and the court fixed the fine at \$16,000. A large number of shippers have also been prosecuted for filing false claims for loss and damage. This practice has been most prevalent in the case of shippers of perishable articles who, on suffering damage, frequently file excessive claims against the responsible carrier. Several prosecutions have also been instituted against shippers who claimed that their property had been damaged when no damage occurred. There have been evidences that the laxness of the carriers in recognizing and paying such false claims sometimes amounts to granting rebates. This question is now under review.

The larger part of the field investigations made by the division did not disclose violations of law. It is proper to state that in many instances investigations of complaints made by shippers and others against carriers disclosed that the complaint was groundless and that the carrier's practice was beyond criticism. Indeed, in one or two cases it was found that the carrier was not only complying with the law but that the very efficiency of its policing arrangements was the real reason for the complaint. As to several other matters investigated, while the practice involved was found to be questionable, the subject was handled by correspondence or conference and the objectionable features thus eliminated. As the strict requirements of the law become more completely appreciated it may be anticipated that the number of cases in which questionable practices can be corrected by conference rather than prosecution will increase.

The practice of carriers in having their fuel coal so billed as to effect a discrimination in their favor against other purchasers of coal has been the subject of numerous prosecutions in previous years. An unlawful practice in connection with the purchase of fuel coal by carriers has been the subject of several field investigations. This practice consists in the carrier buying its fuel coal from large coal producers at a higher price than the fair market price in order to influence the routing of the preferred operator's commercial shipments. Certain attendant circumstances in each case suggest the conclusion that the price paid by the carrier included a bonus which was intended to reduce the published rates. Of course such a practice is unquestionably a device for defeating the lawfully established rates on commercial shipments of the favored coal producer.

DIVISION OF LAW

The division of law, as at present organized, represents the commission in injunction and other proceedings brought by carriers in the federal courts against orders of the commission and in such civil actions as the commission approves to enforce statutory forfeitures incurred by failure to comply with its orders. It co-ordinates and supervises the work of the valuation attorneys in the several districts, and participates, when so directed, in special investigations instituted by the commission.

Since the period covered by the last annual report eight cases involving orders or practices of the commission have been decided by the Supreme Court of the United States. Of these, five, the New Castle switching case, two Meeker reparation cases, the Nashville grain case, and the Nashville coal rate case were decided in favor of the commission. In two others, the Louisville & Nashville mandamus case and the Erie pass case, the decisions were adverse to the commission, while in one, the Ellis compulsory testimony case, the decision of the Supreme Court was substantially in favor of the commission, although adverse in certain respects.

Since the period covered by the last annual report decisions involving orders or requirements of the commission have been rendered in courts other than the Supreme Court of the United States in 14 cases, 13 in favor of the commission and 1 adverse. Of these, 13 were decided in district courts of the United States and 1 in the court of appeals of the District of Columbia. In addition, motions for interlocutory injunctions against orders of the commission have been denied by district courts in 2 cases, and 6 cases have been dismissed in district courts, 5 on motion of complainant carriers and 1 at the instance of the commission. One case was dismissed in the court of appeals of the District of Columbia on motion of the appellant.

During the same period 23 cases involving orders or requirements of the commission have been instituted in district courts of the United States. One of these was an action against a carrier to recover the penalty prescribed by section 16 of the act to regulate commerce for failure to obey an order of the commission.

Twenty-six cases involving orders or requirements of the commission are now pending, 8 in the Supreme Court and 18 in district courts of the United States.

DIVISION OF CARRIERS' ACCOUNTS

During the constructive period in which the systems of carriers' accounts have been developed it has been necessary to revise and reissue a number of accounting classifications for the purpose of more nearly meeting the practical needs of the carriers and the requirements of the commission. The underlying principles of the systems, however, are now well established, and it is believed that no extensive revision of the classifications will be required for some years to come.

The regulations to govern the issuing and recording of passes of steam roads will be revised and amplified to include instructions for the guidance of electric railway companies and carriers by water. Material progress has been made toward standardization of accounting practices. Examinations of carriers' accounts, an important function of the division, are being carried forward by the corps of examiners. Studies of particular phases of accounting practices have been made through the medium of special reports required of carriers. These have proven so satisfactory as an auxiliary to the work being done by examiners of accounts in the determination of accounting practices that it is the intention to increase the number of studies during the coming year. The special work done by examiners and the results derived from the studies mentioned have yielded information of great value which has materially contributed to enhancing the good effect and beneficial results accomplished through examinations of carriers' accounts. The establishment of branch offices at New York, Pittsburgh, Chicago, St. Paul, St. Louis, New Orleans, and San Francisco has resulted in considerable economy of time and in sufficient reduction of traveling expenses to permit a substantial increase in the number of employees.

CLAIMS AGAINST CARRIERS

Since the last annual report the complete results of the special inquiry as to the time required by steam railway carriers to investigate and adjust claims received by them from shippers have been obtained. There follows a tabulation of claims presented to carriers having annual revenues exceeding \$1,000,000, and the number of these claims adjusted by them during the period indicated.

Claims presented to carriers during the calendar year 1914.

Interstate:	Loss and damage.	Over-charge.	Total.
Local	\$713,245	\$219,404	\$932,649
Interline	1,615,494	757,406	2,372,900
Total	2,328,739	976,810	3,305,549
Interstate:			
Local	765,764	224,894	990,658
Interline	181,087	86,144	267,231
Total	946,851	311,038	1,257,889
Grand total	3,275,590	1,287,848	4,563,438

Number of above claims that were adjusted by carriers between Jan. 1, 1914, and March 31, 1915.

Character of claims.	Manner of adjustment.			Total.
	Paid.	Declined.	Withdrawn.	
Loss and damage.....	2,800,399	298,189	56,858	3,155,446
Overcharge	1,003,824	207,217	22,611	1,233,652
Grand total	3,804,223	505,406	79,469	4,389,098
Percentage	86.674	11.515	1.811	

Division of time in which the adjustments were accomplished between Jan. 1, 1914, and Mar. 31, 1915.

After receipt: Period of adjustment.	Loss and damage claims.	Over-charge claims.	Total.	Percentage relation of each period.
Within 15 days.....	1,574,712	548,140	2,122,852	48.366
Within 30 days.....	532,982	248,401	781,383	17.803
Within 60 days.....	456,213	208,201	664,414	15.138
Within 90 days.....	236,056	97,276	333,332	7.595
Within 120 days.....	155,883	61,240	217,123	4.947
Within 6 months.....	112,358	39,567	151,925	3.461
Within 1 year.....	83,421	29,608	113,029	2.575
Over 1 year.....	3,821	1,219	5,040	.115
Total	3,155,466	1,233,652	4,389,098	100

Claims that remained unadjusted on March 31, 1915.

Loss and damage.....	120,144
Overcharge	54,196
Total	174,340

It will be observed that of the 4,563,438 claims presented to carriers, 4,389,098, or 96 per cent, were adjusted. Of the claims adjusted nearly 50 per cent were adjusted within 15 days after receipt by carriers, more than 65 per cent within 30 days, and all but 6 per cent within 120 days. From these figures it appears that much progress has been made by carriers in the matter of handling claims, and there are reasons for believing that their claims' departments are now organized on a more efficient basis than formerly.

DIVISION OF STATISTICS

In addition to its usual work of the past few years the division has devoted considerable time to other important matters, the principal results of which are here stated. In this connection the commission held general hearings and sought the co-operation of committees, representatives of the American Railway Association, state commissions, and other interested parties.

The annual report forms pertaining to steam and electric railway companies were recast for the year ended June 30, 1915. In this revision many changes were necessary to provide for returns in accordance with the revised accounting classifications that became effective at the beginning of the year. Various other changes resulted from new requirements or modifications, the purpose of the changes being to secure information that would be of greater usefulness.

The preparation of annual report forms pertaining to carriers by water having annual operating revenues above \$500,000 and to telephone companies having annual operating revenues above \$250,000 was completed, and these two classes of carriers made

annual reports to the commission for the first time covering the year ended December 31, 1914.

Rules governing the classification of steam-railway employees with respect to occupation and compensation were prescribed by the commission, effective July 1, 1915. As the number of classes of railway employees concerning which returns are now required in the annual reports of steam railway companies was increased from 18 to 68, the need of a detailed classification became urgent in order to secure uniform returns.

Revised rules governing monthly reports of railway accidents were also prescribed by the commission to take effect July 1, 1915, and suitable forms were devised for the required reports of such accidents. These rules, superseding those of 1910, pertain to both steam and electric railway companies, and were deemed necessary principally to obtain more comprehensive and uniform returns of railway accidents.

Following the developments in connection with the separation of operating expenses, described in the last annual report, a new circular outlining a method for separating operating expenses between freight and passenger services was prepared. An order was issued, effective as of July 1, 1915, requiring all carriers having operating revenues in excess of \$1,000,000 to classify each of its various items of disbursement relating to operating accounts according to the relation which such item bears to the freight service or to the passenger and allied services of the carrier, rules being given for apportioning items of expense common to both classes of service, except as to certain items under maintenance of way and structures, which are for the present to be left undivided. Decision as to these items was reserved until a further study of them could be made. The data resulting from this order will not be available until after the close of the fiscal year ending in 1916. It is expected that this class of information will be of assistance not only in rate cases but also in making comparisons of changes in operating costs from year to year and among various railroads in a given year.

The commission has always considered it inadvisable to make publication of statistical matters in permanent form until after the reports on which such publications are based have had, as far as practicable, the benefit of careful scrutiny and correction of errors.

The monthly bulletins of revenues and expenses of steam roads with annual operating revenues above \$1,000,000 were discontinued with the publication of Bulletin No. 69 for the month of August, 1914, but the issuance of a daily bulletin of revenues and expenses of this same class of carriers by railway, chiefly for the benefit of the press, has been continued. This press bulletin shows the cumulative revenues and expenses of the more important railways as reported for the latest current month for which reports are received.

DIVISION OF SAFETY

This division has continued its work as in previous years, and the usual separate report will be issued. During the fiscal year 161 cases of violations of the safety appliance act were prosecuted in the courts, and as in former years, a large majority of the prosecutions were successful. A considerable number of cases appealed to the Circuit Courts of Appeals were decided in favor of the government, as were cases appealed from the latter tribunals to the Supreme Court. Carriers confessed judgment as to 613 counts. The number of violations of the safety appliance act during the year was nearly 50 per cent less than in the preceding year, indicating better inspection and more efficient repair facilities; but there is still much room for improvement. The commission is considering the propriety of extending beyond July next the time within which carriers must equip freight cars with the standard appliances prescribed in 1911. About 900,000 freight cars still remain deficient, in some respects, as related to these requirements. A summary is given of the court decisions recently issued interpreting the safety appliance acts.

Prosecutions for violation of the hours-of-service act have been begun in 125 cases, involving 1,056 counts. In the cases

brought to trial during the year, 187 counts resulted in verdicts in favor of the government and 138 against. The carriers confessed judgment as to 1,189 counts. Suits before the Circuit Court of Appeals were decided in favor of the government in a large majority of cases. The total number of instances of men working beyond the statutory period during the year was 78,940. This is less than half the number reported in the preceding year, and only about one-third the number in the year before that. Penalties for violations have ranged from one cent to \$250, and the commission again recommends that the minimum penalty be \$100. A summary is given of the decisions of the Circuit Courts of Appeals interpreting the hours-of-service act.

The inspectors of the commission investigated 66 train accidents during the year; 40 derailments and 26 collisions. Eight of the collisions occurred under the block system. Attention is called to the fact that collisions are very much less numerous, as compared with derailments, than in former years. The commission believes that the decrease in collisions has been due largely to the work of safety committees and to public investigations of accidents. Bad operating conditions still prevail, however, in too many cases. The former recommendation that train rules be described by law, is repeated, as is that for more thorough investigation of the causes of broken rails. Derailments caused by malicious tampering with track, now, as heretofore, are so numerous as to furnish cause for alarm. Six accidents under this head, during this fiscal year, caused the death of 20 persons and the injury of 92.

The inspectors of the commission have examined, during the year, 342 plans of devices intended to promote safety, of which 35 were considered to possess some merit. Two automatic train control devices have been tested and reported on, and another is now being tested. Arrangements have been made for testing still another, and also an automatic straight air-brake system. The use of the block system increases year by year, but this increase has not kept pace with the increasing need.

BOILER INSPECTION

The work of the division of locomotive boiler inspection will be the subject of a separate report. The number of engines inspected during the year, 73,443, is 19,273 less than the number in the preceding year, and the number found defective, 32,666, is only about two-thirds as many as were found defective in 1914. The number ordered out of service was 2,027, as compared with 3,365 in the preceding year. The number of accidents reported was 424, which is a fourth less than the number in the preceding year, and 50 per cent less than the number in 1912. The casualties connected with these accidents in 1915 were 13 killed and 467 injured, as compared with 23 killed and 614 injured in the preceding year. During the year 284 roads presented 1,099 applications for extension of time for the removal of flues, of which 638, or 58 per cent, were granted. The remaining 42 per cent were refused or granted only after defects disclosed by inspection had been properly repaired. This division is preparing rules for the inspection of locomotives and tenders (other than the boiler and its appurtenances) in accordance with the law passed this year.

DIVISION OF VALUATION

The report contains a six-page review of the work of this division. Twelve roadway and track parties have now been continuously at work since June 1 last in each of the five districts. For five months the mileage covered has exceeded 4,000 miles a month. This rate will be maintained, except in December, when the field men have their vacation. By the first of next month surveys will have been finished on nearly 50,000 miles of road, and it is estimated that in four years more the whole country will have been covered. For the valuation of bridges, buildings, signals, cars and engines, separate parties are organized, and these are now able to carry on their work in proper relation to that of the survey parties.

Some details are given concerning the method of carrying on

the work. It is desirable that a single district organization shall attend to the valuation of the whole of any given company's line, and, for example, the Chicago, Rock Island & Pacific, which extends into two or three districts, cannot be finished until next spring, although work was begun in November, 1914. After the surveys are completed, a further time will be required for collating the facts in the office. In the winter the field parties in the colder regions have to go to the southern states; so that although the work, as a whole, is proceeding at a satisfactory rate, the valuation of particular railroads is not finished.

A great amount of work has been done toward fixing unit prices, and other items of valuation, and accountants have examined the records of the carriers, but no attempt has yet been made to put an actual money value on the inventories, which have been prepared. The valuation of land has not kept pace with the work of the engineers, largely because it has been impossible to obtain suitable land appraisers through civil service channels; but it is not believed that this will result in ultimate delay.

MISCELLANEOUS

The report summarizes the work of the division of indices, the condition of the library of the Commission, in which there are now 13,000 bound volumes and 10,000 pamphlets, and the doings of the commission in Porto Rico. The commission holds that the safety-appliance act should be complied with in Porto Rico, except that cars used in trains exclusively for the transportation of sugar cane might be excepted from the requirement for the use of power brakes. The report ends with a summary of the expenditures of the commission for the fiscal year ending June 30, 1915; total, \$3,933,925.

RECOMMENDATIONS

"The variety and volume of the work already devolved upon the commission necessitate, in its opinion, early enlargement of its membership and express statutory power to act through subdivisions designated by the commission to perform its duties with regard to specified subjects or features of its work, subject, of course, to retention by the commission of its control, as a commission, of all duties and powers delegated to the commission. This recommendation is submitted pending, and without prejudice to, deliberation appropriate to more comprehensive and constructive legislation which the Congress may later deem it wise to consider. The recommendation for enlargement of the membership of the commission is directly connected with and dependent upon the authority to act through subdivisions.

" . . . for the purpose of uniformity and to prevent injustice, there should be provided by law one period, which in the commission's opinion should be three years, for the beginning of all actions relating to transportation charges subject to the act.

"The commission . . . should have right of access to the carriers' correspondence files.

"There should be appropriate and adequate legislation upon the subject of control over railway capitalization.

"In the interests of economy and efficiency and proper protection for records, the commission should be authorized to enter into a lease arrangement, covering a term of years, for suitable quarters, which can thus be secured through the construction of a building for that purpose.

"The use of steel cars in passenger train service should be required, and the use in passenger trains of wooden cars between or in front of steel cars should be prohibited."

BRITISH COAL ABROAD.—The British export trade in coal in October, 1915, amounted to 3,530,546 tons, as compared with 3,944,497 tons in October, 1914, and 6,739,473 tons in October, 1913. In the ten months ended October 31, this year, British coal was shipped to the extent of 36,944,758 tons, as compared with 62,060,846 tons and 61,257,261 tons in the corresponding periods of 1914 and 1913 respectively.

The Cost of Electrification of Chicago Terminals

A Summary of the Items Entering Into the Expenditure for New Equipment. Effect on Operating Expenses

The general conclusions of the committee of the Chicago Association of Commerce on Smoke Abatement and the Electrification of Railway Terminals in Chicago were presented in the *Railway Age Gazette* of December 3, page 1047. The engineering problems involved in this project, the mileage of tracks included and the amount of traffic handled in this area, were given more in detail in the issue of December 10, page 1089. In the present article the estimated cost of this work and also the effect of electrification on operating expenses, as determined by the commission, will be given somewhat in detail.

Detailed estimates were prepared on the basis of the overhead contact system with 2,400 volts direct current and with 11,000 volts single phase alternating current. Estimates of cost were also made for the electrification of the Chicago & North Western by the third rail system with 600 volts direct current, as well as by the two other systems. By the relations found to exist between the total cost of electrification of this one road by the third rail system and by the two other systems, an estimate of the total cost of electrification of all the terminals by the 600-volt third rail system was obtained.

For the purpose of estimates, after the trackage to be electrified had been determined, it was assumed that the work would proceed under a single administration, regardless of the ownership of tracks, and the power and substations were located on this basis. If electrification were to proceed under the management of individual roads, the expenditures would undoubtedly be considerably larger than those shown here. All estimates of the costs of labor and material were based upon figures for 1912. For the purpose of estimates, it was assumed that actual work would begin in December, 1916, and that six years would be required for the completion of the project. All figures given below are, therefore, for the complete cost of electrification on December 31, 1922, making proper allowances for the normal growth in traffic expected during the period of construction. Because of the many elements of uncertainty, such as the possible increases in the costs of labor and material, an allowance of 20 per cent was added for contingencies. An allowance of 10 per cent was added for engineering on all items of the work except rolling equipment, where 5 per cent was added and a flat rate of 1.75 per cent per annum for the entire construction period was allowed for interest.

ELECTRICAL FACILITIES

The load center of the power requirements falls within the limits of the Union Stock Yards. The commission decided that a single power station should be built and selected a location near the south branch of the Chicago river in the vicinity of Ashland avenue, close to this center of power demand. The details of the power station design for both the 2,400-volt d. c. and the 11,000-volt a. c. systems are the same in all essential characteristics. It was estimated that seven 20,000-kw. steam turbine generating sets would be required in each plant.

Estimates for the transmission system provide for 33,000 volts on all circuits; for duplicate circuits between the power station and all substations; for interconnection of substations with transmission lines to a reasonable extent; for overhead wire construction located on the rights of way of the railroads; for 3-phase circuits for the 2,400-volt system and single-phase circuits for the 11,000-volt system, and for supporting the transmission conductors on the structures of the contact system.

The estimates for the substations provide for 11 substations for the 2,400-volt d. c. system and for 31 substations for the 11,000-volt single-phase a. c. system.

The overhead contact system for main track construction for the 11,000-volt a. c. system was designed with a $\frac{5}{8}$ -in. stranded

steel messenger cable of extra high strength, supporting a secondary messenger cable of No. 4/0 steel wire, which in turn supports a No. 4/0 grooved solid copper contact wire. In yards, the overhead construction consists of a $\frac{3}{8}$ -in. stranded steel messenger cable supporting a No. 00 grooved copper contact wire. For the 2,400-volt d. c. system a $\frac{3}{4}$ -inch. stranded steel messenger cable will support a No. 4/0 steel secondary messenger cable, which in turn carries two No. 4/0 grooved copper contact wires for main track construction. For yard tracks a single No. 4/0 copper contact wire will be supported from a $\frac{7}{16}$ -in. stranded steel messenger cable.

Before determining upon the number of locomotives required, a careful study was made of the schedules of trains and of the number of locomotives now used. On roads having 20 or more scheduled passenger trains, one locomotive for each 12 schedules was regarded as sufficient to provide against exigencies outside of ordinary inspections and repairs. It was also assumed that an electric passenger locomotive would be available for service 20 hours per day and that it would be sent to the shops for heavy repairs and overhauling after running 60,000 miles. On this basis such a locomotive would be in service 80 per cent of the time.

It was assumed that an electric freight locomotive would be available for service 20 hours per day and that it would require heavy repairs and general overhauling every 44,000 miles. To provide for these periods and also for the exigencies of special service demands and the bunching of trains, the daily freight locomotive requirement was increased 25 per cent. An allowance of 20 per cent was added to the daily locomotive requirements for yard and transfer service to provide for ordinary inspections, cleaning and repairs, and for extra service and accidents.

On these bases the commission determined that, to handle the traffic existing in 1912, would require 688 yard, 100 freight and 228 passenger locomotives, or a total of 1,016. In addition, the suburban traffic would require 470 motor and 251 trailer cars. Of this number the Chicago & North Western would require 156 locomotives and 248 motor and trailer cars, the Chicago, Milwaukee & St. Paul would require 105 locomotives and the Illinois Central would require 55 locomotives and 203 motor and trailer cars.

ALTERATIONS IN EXISTING FACILITIES

Coincident with electrification, numerous changes in existing facilities would be required. To secure the minimum clearance of 16 ft. 6 in., 70 overhead structures must be modified either by raising the structures and their approaches or by depressing the tracks. It was also assumed that all existing wires and cables which cross above or parallel the tracks in such a manner as to threaten physical interference with the contact system or transmission line would be removed or re-arranged to eliminate any possibility of this interference. All estimates were based upon plans for carrying underground all cross wires except those carrying 11,000 volts or more, while no wires paralleling the tracks were to remain where, if the supporting pole were broken at the ground surface and the wires fell toward the tracks, they would not clear the contact and transmission wires by 3 ft. This latter requirement would make necessary the changing of 197.16 miles of parallel lines.

The installation of electrification would also make necessary the adaptation of the existing signal systems to the use of alternating currents, while it would be necessary to raise many existing signal bridges to give the required overhead clearance.

The elimination of the steam locomotives from the Chicago terminals would result in the dismantling of all engine houses, coaling stations, cinder pits, turntables, water tanks and other

TOTAL ESTIMATED COST OF ELECTRIFICATION FOR 2,400 VOLT D. C. SYSTEM ON DECEMBER 31, 1922

Roads	Power Station	Transmission System	Substations	Switching	Overhead Contact	Bridge Warnings	Return Circuit	Telephone System	Electric Rolling Equipment	Spare Parts	Changes in Structures	Changes in Wire Lines	Cost of Transferring Machinery	New Terminal Facilities	Total Expenditure	
A. T. & S. F.	\$123,583	\$15,796	\$68,490	\$39,579	\$791,519	\$33,816	\$33,884	\$5,824	\$1,473,714	\$6,271	\$19,604	\$82,095	\$6,535	\$1,403,173	\$4,031,758	
B. & O.	150,138	19,190	83,207	26,183	650,714	21,401	111,620	7,846	1,442,226	6,051	30,216	30,216	6,535	1,353,873	3,909,831	
B. & O. C. T.	193,034	24,673	106,981	50,540	1,354,149	65,182	204,111	17,087	1,497,440	8,638	55,706	92,310	6,535	1,353,873	4,211,111	
Cal. Ham. & S. E.	14,299	1,828	7,924	2,588	48,764	1,158	7,158	.....	149,567	938	.....	3,995	.....	540,411	208,747
C. & A. of Ind.	32,683	4,177	18,113	76	1,320	.....	220	.....	544,211	1,718	.....	.....	.....	.....	650,732
C. & A. of Cal. Riv.	148,095	18,929	82,075	26,107	561,279	9,965	89,016	4,813	1,799,251	7,846	16,009	38,663	3,267	64,470	3,175,505	
C. & E. I.	176,693	22,584	97,324	9,286	139,047	25,269	28,269	.....	1,501,187	919	.....	.....	.....	430,433	309,288
C. & E. W.	82,720	10,574	45,849	10,947	164,532	3,267	28,223	626	1,299,325	6,515	.....	.....	.....	.....	2,087,193
C. & N. W.	280,148	1,214,713	5,313,534	33,523	282,574	6,535	38,412	1,300	693,467	2,825	.....	.....	.....	324,247	1,307,633
C. & W. Y. and Belt Ry.	646,512	82,635	358,300	235,954	3,182,476	108,554	1,008,994	44,138	17,013,725	113,914	480,288	393,823	6,632,838	149,798	35,403,102	
C. B. & O.	604,637	77,282	372,635	141,573	3,182,476	109,534	559,673	23,393	3,405,277	28,377	19,504	210,571	876,035	9,551,957	9,551,957	
C. G. W.	82,720	10,574	42,849	15,223	1,811,297	50,071	309,614	9,579	5,145,228	31,226	32,754	83,859	2,229,908	2,229,908	10,520,849	
C. Chicago, Ind. & So.	62,302	7,963	34,328	9,134	138,956	26,138	24,116	.....	933,292	4,400	.....	.....	8,166	1,869,770	1,869,770
C. I. & L.	98,049	12,532	54,339	2,436	156,791	9,802	25,183	2,310	935,745	2,237	.....	.....	4,901	1,669,352	1,669,352
C. Chicago Junction	256,358	32,572	142,075	88,293	1,700,160	4,002	11,649	1,685	931,298	5,768	.....	.....	.....	142,213	1,390,550
C. M. & St. P.	738,860	96,994	420,564	185,085	2,594,331	39,371	283,661	5,680	2,249,730	14,078	44,925	18,740	164,968	185,826	1,390,550	
C. Chicago River & Ind.	53,783	72,061	312,451	60,891	1,459,531	79,068	458,498	22,238	6,420,400	33,574	14,180	128,196	6,535	3,445,359	14,036,282	
Chicago Short Line	12,256	1,567	6,792	2,283	115,379	6,780	251,504	529	4,821,957	32,486	.....	.....	6,535	1,357,665	1,357,665
Chicago Union Transfer	39,832	5,091	22,075	7,916	150,718	1,634	56,605	14,392	1,495,452	673	.....	.....	6,535	1,357,665	1,357,665
Chicago W. P. M. & S.	235,921	30,156	130,754	50,235	885,048	19,522	16,388	1,685	1,495,452	673	.....	.....	.....	.....	9,057,151
E. J. & E.	1,121,521	16,840	73,019	28,467	597,598	7,025	16,388	1,685	1,495,452	673	.....	.....	.....	.....	216,662
Grand Trunk Western	1,245,522	143,729	623,206	149,847	3,261,809	195,708	149,504	1,348	1,747,772	2,531	.....	.....	.....	41,716	183,684
I. C.	87,750	3,394	14,717	9,286	196,037	4,574	149,504	1,348	1,747,772	2,531	.....	.....	.....	1,896	559,686
Ind. Harb. Belt	87,750	10,705	46,415	10,352	340,670	10,129	149,504	1,348	1,747,772	2,531	.....	.....	.....	191,514	3,043,104
L. S. & M. S.	67,750	10,705	46,415	10,352	340,670	10,129	149,504	1,348	1,747,772	2,531	.....	.....	.....	15,321,113	3,857,173
M. C. & M. S.	225,653	28,459	374,149	72,309	1,732,524	34,470	55,529	2,719	9,257,263	67,962	4,084	229,935	6,535	4,586,859	20,730,056	
Mich. Cent.	225,653	28,459	374,149	72,309	1,732,524	34,470	55,529	2,719	9,257,263	67,962	4,084	229,935	6,535	4,586,859	20,730,056	
M. St. P. & S. M.	123,624	16,057	69,622	25,727	580,754	23,361	131,197	5,487	2,096,692	9,152	.....	.....	.....	155,487	1,033,650
N. Y. C. & H. R.	311,553	40,077	174,773	60,282	1,405,829	48,846	131,197	6,594	1,523,262	3,256	.....	.....	.....	2,400,564	10,981,877
P. C. & St. L.	604,637	77,282	372,635	141,573	3,182,476	109,534	131,197	13,911	2,977,721	5,623	.....	.....	.....	1,094,096	3,863,553
P. C. & St. L. Chicago	235,921	3,003	13,019	20,094	406,721	61,506	268,320	23,270	4,751,260	1,558	.....	.....	.....	3,267	1,462,346
Pullman R. R.	236,952	30,286	131,320	31,664	643,325	7,760	109,955	25,270	4,751,260	1,558	.....	.....	.....	1,403,173	6,562,877
Wabash	236,952	30,286	131,320	31,664	643,325	7,760	109,955	3,129	2,855,947	9,862	.....	.....	.....	1,769,136	10,091,375
	\$10,213,458	\$1,305,444	\$5,660,352	\$1,522,285	\$33,895,276	\$1,071,989	\$6,069,899	\$272,052	\$84,003,395	\$502,725	\$834,261	\$2,028,007	\$6,993,919	\$96,383	\$37,197,363	\$181,891,121

*Included in the estimates for the Chicago Junction Railway. †Included in the estimates for the Chicago & Western Indiana R. R.

*Included in the estimates for the Chicago Junction Railway. †Included in the estimates for the Chicago & Western Indiana R. R.

TOTAL ESTIMATED COST OF ELECTRIFICATION FOR 11,000 VOLT A. C. SYSTEM ON DECEMBER 31, 1922

FOR 1900 VOL. A. C. SYSTEM ON DECEMBER 31, 1922																
Roads	Power Station	Transmission System	Sub-stations	Switching Stations	Overhead Contact System	Bridge Warnings	Return Circuit	Induction Prevention	Telephone System	Electric Rolling Equipment	Spare Parts	Changes in Structures	Changes in Wire Lines	Cost of Transferring Machinery	New Terminal Facilities	Total Expenditure
A. T. & S. F.	\$124,655	\$19,586	\$24,409	\$14,900	\$672,996	\$33,816	\$99,569	\$17,075	\$5,824	\$1,666,177	\$6,060	\$19,604	\$82,095	\$6,535	\$1,403,173	\$4,028,852
B. & O.	151,441	23,795	90,768	30,768	1,002,031	21,401	79,871	17,236	7,846	1,638,007	5,794	30,216	30,216	6,535	1,353,873	3,889,521
B. & O. C. T.	194,710	30,593	109,981	59,540	1,354,149	65,182	153,117	33,158	17,087	1,660,038	8,306	55,706	92,310	6,535	1,353,873	3,976,592
Cal. Ham. & S. E.	14,423	2,266	7,924	2,588	45,888	974	5,200	1,710	.....	164,499	914	.....	3,995	.....	540,411	214,390
C. & A. of Ind.	32,967	5,180	18,713	76	1,323	.....	159	.....	.....	612,237	1,662	.....	.....	.....	.....	708,213
C. & A. of Cal. River	149,393	23,471	82,075	26,107	476,859	9,965	65,844	17,075	4,813	2,021,579	7,594	16,009	38,663	3,267	64,470	3,230,069
C. & E. I.	178,226	28,003	97,358	9,286	127,954	.....	18,292	6,092	.....	165,120	7,898	.....	112,545	.....	430,433	302,229
C. & E. W.	83,447	11,111	42,849	16,432	145,594	3,267	28,343	6,566	626	1,471,877	6,216	.....	59,598	.....	324,247	2,172,491
C. & W. Y. and Belt Ry.	2,210,831	347,372	1,214,713	15,223	5,313,534	108,554	735,684	9,923	3,300	783,083	2,684	.....	14,143	.....	149,798	1,317,194
C. B. & O.	652,123	102,463	372,635	141,573	3,182,476	109,534	421,501	92,430	44,138	18,236,693	110,184	480,288	393,823	.....	6,632,838	34,367,826
C. B. & O. C. G. W.	609,885	95,827	372,635	141,573	3,182,476	109,534	421,501	92,430	23,393	3,619,806	27,277	19,268	210,571	.....	19,268	8,795,588
C. G. W.	83,447	13,111	42,849	15,223	1,811,297	50,071	228,980	53,458	9,579	5,145,228	30,195	32,794	83,859	.....	876,035	1,938,597
Chicago, Ind. & So.	98,049	15,549	54,339	2,436	156,791	26,138	18,842	5,967	.....	1,052,752	4,268	.....	12,252	.....	2,229,908	10,308,399
C. I. & L.	98,049	15,549	54,339	2,436	156,791	26,138	18,842	5,967	.....	1,052,752	4,268	.....	12,252	.....	2,229,908	10,308,399
C. I. & L. So.	98,049	15,549	54,339	2,436	156,791	26,138	18,842	5,967	.....	1,052,752	4,268	.....	12,252	.....	2,229,908	10,308,399
Chicago Junction	258,583	40,629	150,438	60,891	1,459,531	4,002	8,293	1,635	1,685	1,057,394	3,612	.....	104,458	.....	142,213	956,972
C. M. & St. P.	765,445	120,269	312,451	60,891	1,459,531	39,371	209,062	57,521	5,680	2,473,716	13,636	44,925	54,575	.....	185,826	1,456,972
C. M. & St. P. Ind.	765,445	120,269	312,451	60,891	1,459,531	39,371	209,062	57,521	5,680	2,473,716	13,636	44,925	54,575	.....	185,826	1,456,972
Chicago River & Ind.	568,676	89,352	111,765	11,765	1,196,061	56,605	184,649	40,250	14,392	5,110,153	31,527	14,180	128,196	6,535	3,445,359	13,936,034
C. R. I. & P.	12,363	1,942	2,430	860	42,740	6,780	1,685	1,495,452	652	.....	.....	.....	.....	.....	.....	104,887
Chicago Short Line	40,178	6,311	7,896	1,375	99,417	1,634	1,685	1,495,452	652	.....	.....	.....	.....	.....	.....	8,797,061
Chicago Union Transfer	237,979	37,392	130,754	50,235	885,048	19,522	1,348	1,747,772	2,531	.....	.....	.....	.....	.....	.....	3,792
E. J. & E.	132,897	20,881	62,302	22,924	3,261,809	195,708	1,685	9,257,263	11,428	.....	.....	.....	.....	.....	.....	163,847
Grand Trunk Western	1,134,261	178,218	229,924	56,161	2,690,575	7,025	107,892	32,819	1,348	1,921,084	17,026	.....	7,036	.....	1,896	571,204
I. C.	66,781	1,219	5,264	3,496	169,063	4,574	21,857	6,954	5,006	1,618,617	5,584	1,633	24,050	6,535	191,514	3,038,284
Ind. Harb. Belt	84,757	4,209	18,713	76	1,320	.....	14,129	6,774	22,719	9,692,672	6,050	4,084	229,935	8,166	4,586,859	19,877,013
L. S. & M. S.	680,869	13,273	42,849	15,223	1,811,297	50,071	9,579	5,145,228	9,579	5,145,228	9,579	.....	1,111	.....	5,689	569,917
Mich. Cent.	224,869	35,288	144,139	58,903	1,133,6	25,151	1,758	1,497,440	7,158	1,497,440	7,158	.....	13,170	.....	155,487	961,229
M. St. P. & S. M.	126,716	19,910	24,044	9,685	471,165	23,361	6,594	1,523,262	3,256	1,523,262	3,256	.....	90,506	6,535	2,400,564	10,492,711
N. Y. C. & St. L.	316,275	16,025	20,045	1,605	55,179	8,120	2,812	1,405,829	14,621	1,405,829	14,621	.....	188,935	3,267	1,219,244	4,566,265
P. C. & St. L.	609,885	95,827	372,635	141,573	3,182,476	109,534	421,501	92,430	23,393	3,619,806	27,277	19,268	210,571	.....	1,405,829	6,536,482
Pullman R. R.	239,009	37,554	131,320	31,664	643,325	7,760	4,525	2,855,947	9,459	2,855,947	9,459	.....	126,651	13,069	1,769,136	9,237,962
Wabash	236,952	30,286	131,320	31,664	643,325	7,760	4,525	2,855,947	9,459	2,855,947	9,459	.....	20,521	6,535	34,131	743,549
																5,500,419
Included in the estimates for the Chicago Junction Railway. Included in the estimates for the Chicago & Western Indiana R. R.																
	\$10,302,104	\$1,618,693	\$2,024,736	\$573,073	\$28,141,188	\$1,071,989	\$4,446,033	\$996,727	\$272,052	\$91,703,557	\$485,343	\$834,261	\$2,028,007	\$6,111,407	\$96,383	\$37,197,363

*Included in the estimates for the Chicago Junction Railway. †Included in the estimates for the Chicago & Western Indiana R. R.

equipment incident to the operation of steam locomotives. In determining whether a facility should be entirely abandoned or transferred to a new location, it was necessary to consider not only the character and condition of the facility, but also the conditions on the individual roads. A road like the Chicago & Western Indiana, for instance, which would operate all of its trackage electrically, would have no further use for any such equipment, while the trunk lines would continue to operate with steam beyond the limits of the electrification, and might transfer portions of such facilities to new locations. However, the extent to which such procedure may be applicable to individual roads cannot be determined without considerable investigation, and no allowance was made for such facilities beyond a salvage value. It was, however, assumed that much of the machinery now used for steam equipment could be transferred to the new locations at considerably less than the cost of new equipment, and that a considerable portion of such equipment might be retained in its present location for the maintenance of electrical equipment. The first cost of such facilities as would be abandoned was estimated at \$3,502,530, the present value, \$2,596,837, and the salvage value, \$278,880, leaving a net amount of \$2,317,957 which would be lost. This latter amount could not be charged to capital and must therefore stand as an independent item representing property wholly dissipated.

The electrification of the Chicago terminals would necessitate a considerable amount of new construction of facilities, such as engine houses, ash pits, machine shops, water tanks, coaling stations and other equipment at transfer yards at the limits of complete electrification. It would be necessary to provide entirely new facilities at 18 such transfer points, while some facilities exist at 15 other points which could be remodeled and enlarged. In all, 54 yards would require some modifications of track arrangements to meet the new conditions imposed by electrification.

From a study of operating conditions, it was determined that approximately 2½ hours would be saved per passenger locomotive daily by the shortening of the steam locomotive run. From a study of the scheduled requirements, it was considered possible to reduce the number of steam locomotives required for this service by 37. Similarly 20 freight locomotives, 151 suburban locomotives and 742 suburban passenger coaches would be released in addition to the 140 locomotives now required for transfer service and 612 for yard service. On the basis of the increased traffic and the increased amount of equipment thus necessary to handle this traffic, on December 31, 1922, the release value of this equipment on that date would be \$9,496,806.

The costs given above cover only the equipment necessary for the electrical operation of the facilities included in the zone under consideration with the normal growth which may be expected up to December 31, 1922. For operating reasons, many of the railroads would deem it expedient to extend the electrification zone further from the city, thus increasing the cost. Likewise, any improvement of this magnitude would precipitate other betterment work, such as track elevation, which might otherwise be deferred for a number of years.

EFFECTS ON OPERATING COSTS

The electrification of the railway terminals of Chicago would introduce a new system of operation over all electrified trackage. Those roads with trackage entirely within the city would discontinue all use of steam locomotives. Those operating beyond the proposed limits of electrification would, however, continue to use steam locomotives outside the city after the electrification had been accomplished in Chicago. The changes in operating conditions which would result are of a three-fold character: (1) Those incident to the introduction of electric operation on trackage within the proposed limits of electrification; (2) those incident to the operation of transfer stations at which a change in motive power would be made from steam to electric and vice versa; (3) those resulting from the shortening of the steam-operated divisions at present terminating in Chicago.

To arrive at an accurate comparison of the cost under steam and electric operation, the commission analyzed the expenses in

accordance with the classification of the Interstate Commerce Commission. Considering only the 2,400-volt d. c. and the 11,000-volt a. c. systems, the effects on the expenditures for maintenance of way are negligible except for the item of buildings, fixtures and grounds, for there is a heavy increase resulting from the greater expenditures for the power house, substations and other buildings required for electric operation.

The comparison of steam and electric locomotive repairs shows a reduction of over \$700,000 in favor of the latter. In arriving at this figure the cost per locomotive mile for repairs to steam locomotives was ascertained from reports furnished by 25 roads for a period of five years, the data furnished by these roads being applied to the respective locomotive mileages of those roads. For comparative purposes, unit figures per locomotive mile for electric locomotives were assumed as \$0.055 for passenger and freight locomotives, and \$0.050 for yard and transfer locomotives.

With the operation of multiple unit equipment for suburban passenger service, it was estimated that 50 per cent of the present locomotive switching in connection with the handling of suburban passenger trains would be eliminated, causing a reduction of nearly \$27,000 in the transportation account for yard conductors and brakemen, and \$21,000 in the account for yard enginemen. The elimination of steam locomotives would, of course, also remove all charges for fuel and water for locomotives.

Based upon reports furnished by the roads, it was determined that the average expense for enginemen and firemen for suburban passenger locomotives in 1912 was 8.54 cents per locomotive mile. The estimated expense of a motorman on suburban multiple unit trains was fixed at 4.675 cents per mile, or \$4.25 per hundred miles, with 10 per cent for overtime and terminal delay. This was based on present rates of pay of engineers on self-propelled cars. This is equivalent to a reduction of \$163,842 in this account.

Based on figures furnished by the roads, showing engine-house expenses for road locomotives per locomotive mile in comparison with data for similar expenses on electrically-operated roads, it was assumed that the expense chargeable to this account for electric locomotives and electric multiple-unit motor cars would be one-fifth of the present enginehouse expense involved in caring for steam locomotives, showing a saving of over \$525,000 in favor of electric equipment. A summarized comparison of these accounts for steam and electric operation for the items affected is shown in the following table:

SUMMARY OF ANNUAL OPERATING EXPENSE UNDER AFFECTED ACCOUNTS, FOR STEAM AND FOR ELECTRIC OPERATION

		(Basis of 1912)		
Acct. No.	Item	Steam	2,400-volt d. c.	11,000-volt a. c.
3	Ties	\$463,183	\$463,183	\$463,183
6	Roadway and track	243,663	243,663	243,663
7	Removal of sand, snow and ice	240,740	240,740	240,740
11	Grade crossings, fences, cattle guards and signs	42,608	42,608	42,608
13	Signals and interlocking plants	405,512	431,090	430,060
14	Telegraph and telephone lines	39,864	44,384	44,384
15	Electric power transmission .....	.....	997,879	986,710
16	Buildings, fixtures and grounds	139,116	642,623	642,623
25	Steam and electric locomotive—			
28	repairs	1,746,395	1,036,852	1,036,852
31A	Passenger train trailer-cars—			
	repairs	207,313	67,041	67,041
31B	Multiple-unit motor cars—repairs .....	.....	168,909	167,515
37	Electric Equipment of motor cars—			
	repairs .....	.....	106,439	106,439
47A	Substations—operation and main-			
86	tenance of equipment .....	.....	90,000	17,050
47B	Power station—operation and			
86	maintenance of equipment .....	.....	2,065,827	1,932,894
68	Yard conductors and brakemen	53,636	26,818	26,818
71	Yard enginemen	42,539	21,270	21,270
72	Engine house expense—yard	633,482	126,696	126,696
73	Fuel for yard locomotives	4,076,978	.....	.....
74	Water for yard locomotives	137,044	.....	.....
79	Road enginemen (steam) and			
	motormen (electric) in subur-			
80	ban passenger service	362,020	198,178	198,178
81	Engine house expense—road	659,912	131,982	131,982
82	Fuel for road locomotives	1,206,178	.....	.....
94	Telegraph and telephone opera-			
	tion	117,373	209,589	213,789
	Totals	\$10,934,064	\$7,355,771	\$7,140,495

In studying the effect of the operation of transfer stations for

the changing of motive power from steam to electric and vice versa, it was found that in 1912, 704 passenger trains and 488 freight trains would be required to stop at these transfer stations to change power daily. The principal expense would be that involved in the operation of these terminals, although a value was also assigned for delay and damage incident to such stops, this being fixed at 45 cents for passenger trains and \$1.28 for freight trains. The cost of the operation of these terminals was estimated as follows:

	Per Annum
Increased cost of handling supplies.....	\$30,000
Handling locomotives, supplying water, inspecting trains and exchanging motive power, and maintaining tracks, contact system and bonding.....	1,126,587
Telegraph and telephone operation at transfer stations.....	45,900
Delay and damage incident to stops at transfer stations.....	343,626
Total	\$1,546,113

The electrification of the railroad terminals of Chicago would have the effect of creating additional operating divisions. Where the engine districts as now operated are short, this would have the effect of creating constructive mileage. The conditions existing on the individual roads were considered to ascertain to what extent this would be reflected in increased operating cost. This was placed at \$450,000. The estimated net operating result of electrification on the basis of the traffic of 1922 is shown in the table below.

ESTIMATED NET OPERATING RESULT OF ELECTRIFICATION (Basis of 1922)

System of Traction	All Services		
	Expense under accounts for operation within the proposed limits of electrification	Increase in operating expenses due to the new transfer stations and the reduced length of steam-operated divisions immediately beyond the limits of electrification	Net decrease as compared with the cost of steam operation.
Steam	\$14,214,283		
11,000-volt a. c. overhead..	9,282,644	\$2,594,947	\$2,336,693
2,400-volt d. c. overhead..	9,562,502	2,594,947	2,056,834
600-volt d.c. third rail..	10,974,987	2,594,947	644,349

There are also certain indeterminate results of electrification which should be considered, as, for instance, the increased capacity of those terminals which are now approaching their limit under steam operation. The commission also stated that another benefit to be expected is increased reliability of service. From the standpoint of safety, electrification introduces an added hazard, while it also permits the introduction of compensating influences, with a net result so slight as to be negligible.

SUMMARY

As stated previously, the estimated cost of electrification on the basis of a 11,000-volt a. c. system was \$178,929,241. Applying no depreciation to those accounts for alterations to bridges and buildings, changes in line wires and changes in signals, and allowing 4 per cent depreciation on power house and substation equipment, and 5 per cent on rolling equipment, on the transmission and overhead contact system, and also on the new transfer and locomotive facilities, gives total depreciation charge of \$7,808,278. The net result of electrification as determined by the commission is, therefore, as follows:

ACCOUNTING STATEMENT FOR DISCLOSING THE FINANCIAL PRACTICABILITY OF ELECTRIFICATION

I. Annual Charges:	
1. Interest	\$8,906,362
2. Depreciation	7,808,278
3. Replacement of dissipated assets.....	231,796
Total charges	\$16,946,436
II. Annual Revenues:	
1. Increase in net revenues.....	\$2,336,693
2. Indeterminate benefits	
Balance, annual deficit on investment.	\$14,609,743

SETTLING RAILROAD WAGES*

By ELISHA LEE

General Superintendent, Philadelphia, Baltimore & Washington.

A serious problem confronts both the railroads and the public today. It is a subject upon which much statesmanship must be expended in the next few years if the problem is to be solved to the credit of our nation. It is a problem that you younger men will have to wrestle with as citizens. I refer to the labor problem and particularly the railroad labor problem. . . . The arbitrators between the locomotive engineers and the Eastern railways, in 1912, gave a warning to which the public has been singularly indifferent. They said:

"The food and clothing of our people, the industries and the general welfare of the nation, cannot be permitted to depend upon the policies and the dictates of any particular group of men, whether employers or employees, nor upon the determination of a group of employers and employees combined. The public utilities of the nation are of such fundamental importance to the whole people that their operation must not be interrupted, and means must be worked out which will guarantee the result."

Adjustment of working conditions has been considered a matter of private concern affecting only employer and employed. Yet the railway provides a service which is a necessity of the entire people, and the interruption of this service would prove to be a national calamity. Wage increases are sooner or later shifted to the shoulders of the people and the public's interest in railway labor controversies is supreme and should assert itself far more effectively than it has thus far.

At the present time we see very little in the papers about labor movement on the railroads, but as a matter of fact the pot is seething hot. A movement is now on foot to secure the association of all the train organizations in one united demand upon the roads. On many of the railway systems federation of the four brotherhoods is in effect and on others working agreements exist between two or three of the organizations. Faced by this new idea of a united labor force in an undivided country, the public may well give heed and devote its best thought to a consideration of its own interest in the outcome.

In recent negotiations and arbitration proceedings, among other arguments, a demand for standardization has been more or less vigorously pressed—the same pay for the same work in the same class of service, whether train operation is on single or double track, in mountainous or level country, in branch or main line service, on lines of heavy or light traffic. But the standardization wanted is standardization upward, as was very frankly stated in a recent controversy by one of the labor leaders, and leaves the high spots plainly in view.

The result of such standardization is to raise the lower end of the wage scale regardless of work performed or responsibility incurred. Results obtained under such conditions have been attained in a haphazard fashion and are attended by much discrimination.

There has been little in the process up to the present time that could be designated as scientific, such questions often being settled from the standpoint of immediate expediency.

No final solution of so perplexing a problem as that of the relations of capital and labor is expected within the near future, but we should begin at once to give serious thought to the whole question and thus lay the foundation for a larger participation on the part of the public in the settlement of disputes in which its interest is paramount.

Do not understand me as criticizing the individual or the great mass of railroad employees. I know of no finer body of men generally than the employees of the railroads today. They are hard-working, conscientious men, who are sincerely and devotedly doing their work. I would venture the guess that we have very slight, if any, fault to find with 98 per cent of the employees, and I am proud of the fact that it is my good fortune to work with them.

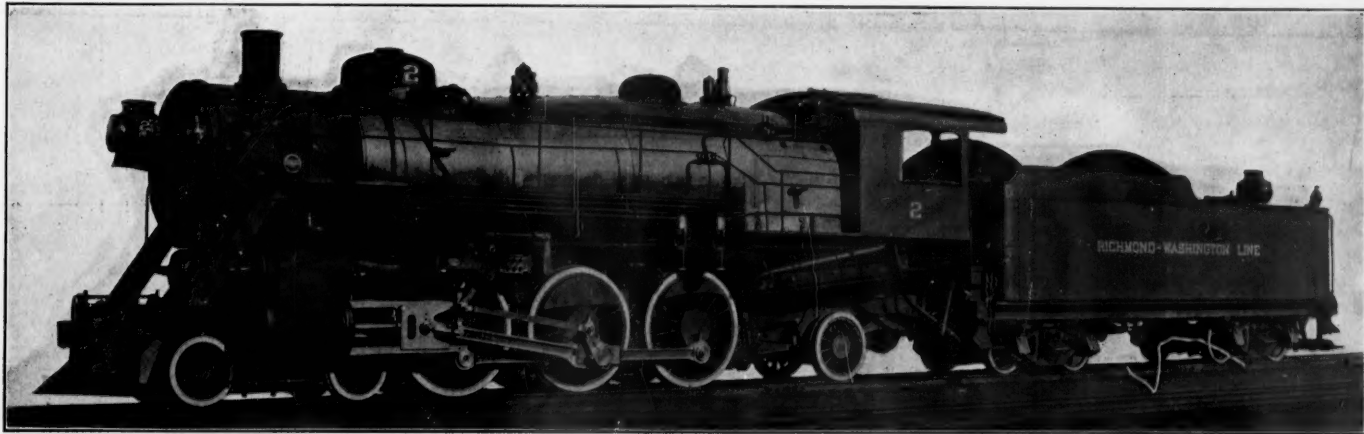
*From an address delivered at Delaware College, Newark, Del., December 9.

Powerful Pacific Type Locomotive for the R., F. & P.

Exceeds All Previous Pacific Type Engines in Tractive Effort and is Among the Largest in Boiler Capacity

The Baldwin Locomotive Works has recently completed for the Richmond, Fredericksburg & Potomac two Pacific type locomotives which are the most powerful of their type in hauling capacity thus far constructed by the builders. They have a

board Air Line and the Atlantic Coast Line. These trains, especially during the winter tourist season, are frequently very heavy, and are hauled at an average speed, including from two to six stops, of 36 to 42 miles an hour. Including the new



Richmond, Fredericksburg & Potomac Heavy Pacific Type Locomotive

tractive effort of 47,400 and a comparison of their principal dimensions with those of several other large Pacific type locomotives exerting a tractive effort of about 42,000 lb. or over, is given in the table.

engines, four classes of Pacific type locomotives have been built for this service by the Baldwin Locomotive Works. Compared with the first of these, which were built in 1904, the new locomotives show an increase in tractive effort of 82 per cent.

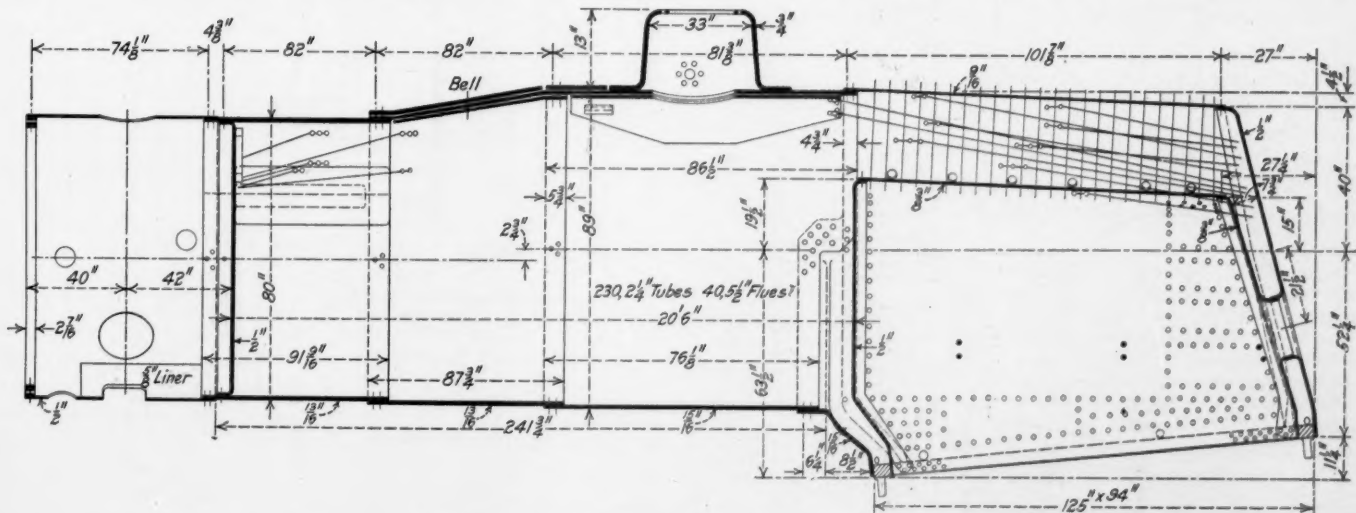
COMPARISON OF RECENT PACIFIC TYPE LOCOMOTIVES EXERTING OVER 42,000 LB. TRACTIVE EFFORT

	R. F. & P.	C.&O.	C.C.&O.	C.&O.	B.&O.	D.,L.&W.	Erie.	C.,B.&Q.	Penn.
Builder	Baldwin.	A.L.Co.	B'ldw'n.	B'ldw'n.	B'ldw'n.	Lima.	B'ldw'n.	B'ldw'n.	Penn.
Cylinders, dia. and stroke, in.	26x28	27x28	25x30	27x28	24x32	25x28	25x28	27x28	27x28
Driving wheels, dia, in.	68	69	69	73	74	69	69	74	80
Boiler pressure, lb. per sq. in.	200	185	200	185	205	200	200	180	205
Heating surface, evaporating, sq. ft.	4,205	4,478.8	3,982	3,786	3,936	3,960	3,966	3,364	4035.4
Heating surface, superheater, sq. ft.	975	991	955	879	833	740	879	751	1153.9
Grate area, sq. ft.	66.7	80.3	53.8	59.6	70	69	58	58.7	70
Weight on drivers, lb.	188,000*	191,000	176,900	179,900	166,200*	184,600	184,300	169,700	305,000
Weight, total engine, lb.	293,000*	312,600	280,300	282,000	263,800*	297,600	281,600	266,400	200,000
Tractive effort, lb.	47,400	46,600	46,000	44,000	43,400	43,200	43,200	42,200	41,845

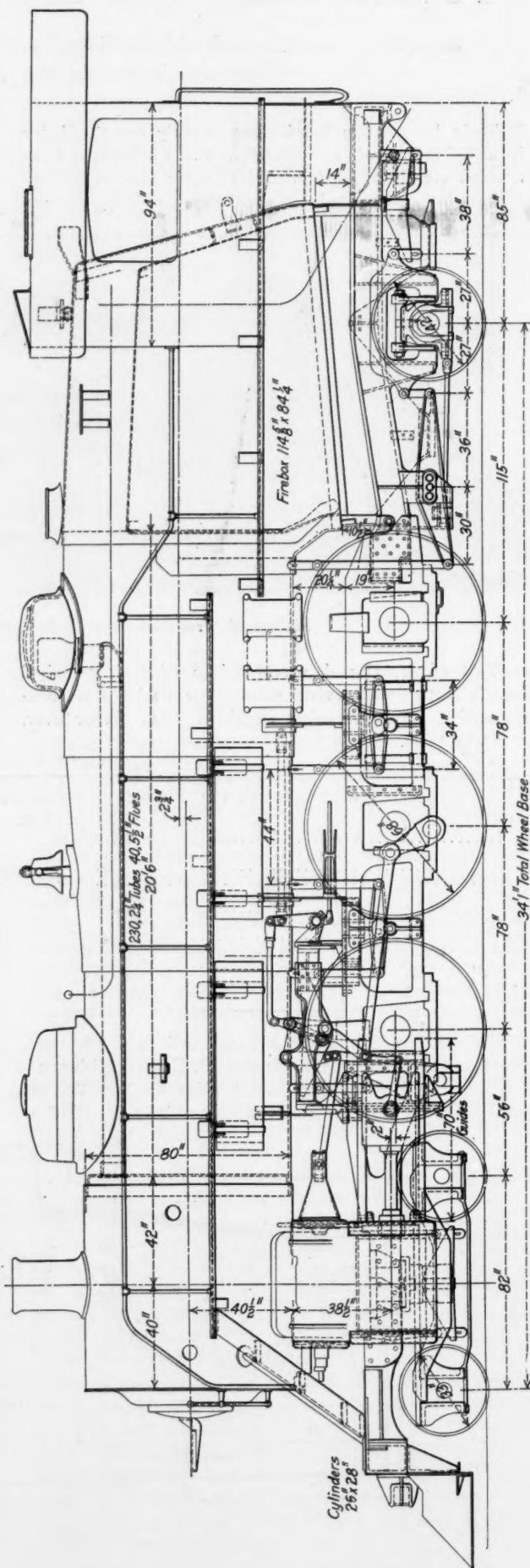
* Weights estimated.

The Richmond, Fredericksburg & Potomac is a double-track line connecting the cities of Washington, D. C., and Richmond, Va. The distance is 116 miles, and besides local traffic, the road handles all the through northern connections of the Sea-

The boiler is of the extended wagon-top type, measuring 80 in. in outside diameter at the first ring and 89 in. at the dome ring. It is fitted with a one-piece pressed steel dome, measuring 33 in. in diameter by 13 in. in height. The longitudinal seams



Boiler of the Richmond, Fredericksburg & Potomac Pacific Type Locomotive



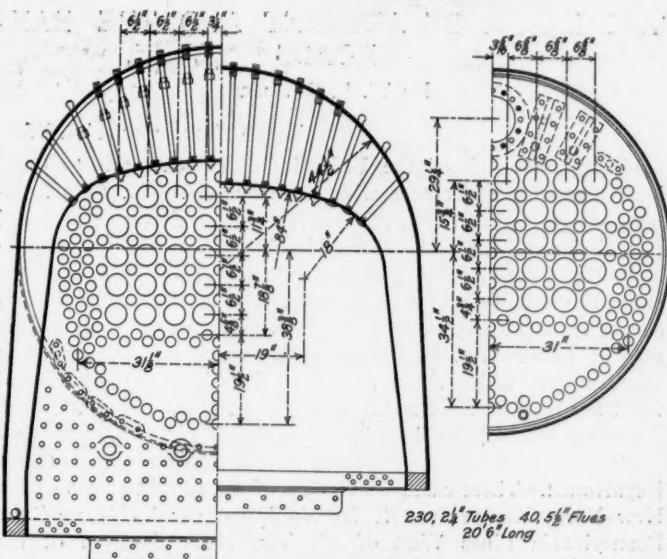
Elevation and Cross Sections of Richmond, Fredericksburg & Potomac Pacific Type Locomotive

are welded at the ends and have a strength equal to 90 per cent of the solid plate. A complete installation of flexible stay bolts is used, and the front end of the firebox crown is supported by three rows of Baldwin expansion stays. The firebox is carried on expansion plates at the front and back, and the boiler barrel is supported by waist sheets at three intermediate points. A Security sectional arch, a 40-element Schmidt superheater and a Chambers throttle valve are included in the boiler equipment.

The steam distribution is controlled by "Jack Wilson" piston valves, 14 in. in diameter, driven by the Baker valve gear, and the engines are equipped with the Lewis power reverse gear, furnished by the Compensating Specialties Company, Richmond, Va. Graphite lubricators are applied to the steamchests.

Special material is used quite extensively in the construction of these locomotives. The driving and engine truck axles are of heat-treated steel. Nikrome steel is used for the main and side rods, the crank pins and the cross-head pins, and Hunt-Spiller metal for the cylinder and steam chest bushings, as well as the piston and valve packing rings.

The main frames are of vanadium steel, 5 in. wide, each being cast in one piece with a single front rail, and are spaced transversely 42 in. between centers. The rear frames were fur-



Cross Sections of the Boiler

nished by the Commonwealth Steel Company, and are cast in one piece with the back foot-plate, trailing truck pedestals, radius-bar cross-tie and other projections and braces. This constitutes an elaborate casting, with an over-all length of 15 ft. 4 1/4 in. It has a slab fit in recesses formed in the main frames, and is secured to the latter on each side by 13 horizontal bolts, each 1 1/4 in. in diameter. Throughout the greater part of its length on each side this casting has a Z-section with walls 12 in. deep and 1 1/2 in. thick. A transverse brace is placed over the rear truck pedestals. The holes for the trailer truck radius-bar pin, equalizing beam pins, etc., are bushed.

The main frames are braced transversely by the guide yoke, valve motion bearer and waist-sheet cross-tie, the latter being a broad casting placed between the main and rear pairs of driving-wheels. The front and main driving pedestals are also transversely braced, the brace at the front pedestal being used as a fulcrum for the driving-brake shaft.

The rear truck is of the Rushton type, with inside journals. In this design the truck swing links are pinned to a pair of yokes which constitute part of the equalization system, the yokes being prevented from moving laterally by the truck pedestals. The pedestals on each side are fitted with renewable wearing plates 3/16 in. thick. There is no cross-connection in the driving equalization system, as the driving and truck journals are in line and the equalizers between the rear drivers and the trailer connect directly with the spring hangers.

The arrangement of the running-boards and hand-rails is suggestive of the practice followed in certain parts of Continental Europe. The hand-rails are placed outside the running-boards, the total width over the latter being 10 ft. 3 in., and a flight of steps leads from the running-boards to the front bumper. This arrangement adds materially to the convenience and safety of the engine crew.

These locomotives, owing to their high tractive effort and steam capacity, are among the most notable of their type thus far built. Their leading dimensions are given in the following table:

General Data	
Gage	4 ft. 8 1/2 in.
Service	Passenger
Fuel	Bituminous coal
Tractive effort	47,400 lb.
Weight in working order	293,000 lb.
Weight on drivers	188,000 lb.
Weight on leading truck	53,000 lb.
Weight on trailing truck	42,000 lb.
Weight of engine and tender in working order	472,000 lb.
Wheel base, driving	13 ft.
Wheel base, total	34 ft. 1 in.
Wheel base, engine and tender	72 ft. 4 in.
Ratios	
Weight on drivers ÷ tractive effort	3.96
Total weight ÷ tractive effort	6.18
Tractive effort × diam. drivers ÷ equivalent heating surface*	5.69
Equivalent heating surface* ÷ grate area	85.0
Firebox heating surface ÷ equivalent heating surface*, per cent	4.1
Weight on drivers ÷ equivalent heating surface*	33.2
Total weight ÷ equivalent heating surface*	51.7
Volume both cylinders	17.2 cu. ft.
Equivalent heating surface* ÷ vol. cylinders	329.4
Grate area × vol. cylinders	3.9

Cylinders	
Kind	Simple
Diameter and stroke	26 in. by 28 in.

Valves	
Kind	"Jack Wilson" Piston
Diameter	14 in.

Wheels	
Driving, diameter over tires	68 in.
Driving journals, main, diameter and length	11 1/2 in. by 13 in.
Driving journals, others, diameter and length	11 1/2 in. by 13 in.
Engine truck wheels, diameter	33 in.
Engine truck, journals	6 in. by 10 in.
Trailing truck wheels, diameter	42 in.
Trailing truck, journals	8 1/2 in. by 14 in.

Boiler	
Style	Wagon top
Working pressure	200 lb. per sq. in.
Outside diameter of first ring	80 in.
Firebox, length and width	114 1/2 in. by 84 1/2 in.
Firebox plates, thickness	Tube, 1/2 in.; others, 3/8 in.
Firebox, water space	Front, 5 in.; sides, 4 1/2 in.; back, 4 1/2 in.
Tubes, number and outside diameter	230—2 1/2 in.
Flues, number and outside diameter	40—5 1/2 in.
Tubes and flues, length	20 ft. 6 in.
Heating surface, tubes and flues	3,942 sq. ft.
Heating surface, arch tubes	31 sq. ft.
Heating surface, firebox	232 sq. ft.
Heating surface, total	4,205 sq. ft.
Superheater heating surface	975 sq. ft.
Equivalent heating surface*	5,667.5 sq. ft.
Grate area	66.7 sq. ft.

Tender	
Weight	179,000 lb.
Wheels, diameter	33 in.
Journals, diameter and length	6 in. by 11 in.
Water capacity	10,000 gal.
Coal capacity	15 tons

*Equivalent heating surface = total evaporative heating surface + 1.5 times the superheating surface.

NO STEEL CORPORATION REBATES

The following is the full text of the report of the Interstate Commerce Commission in the matter of alleged rebates to the United States Steel Corporation:

On February 2, 1914, the Senate of the United States passed the following resolution:

Resolved, That the Interstate Commerce Commission is hereby requested to conduct an examination and inquiry for the purpose of ascertaining whether the United States Steel Corporation, or any of its subsidiaries, has been guilty of giving or receiving any unlawful rebates, offsets, or preferences, especially within the last six years; and if said commission finds that such unlawful rebates, offsets, or preferences have been given or received, then the commission is directed to report the dates and amounts thereof to the Senate for its information.

Shortly after a copy of the resolution had reached us the commission, by appropriate order instituted an investigation—for the purpose of ascertaining whether the United States Steel Corporation, or any of its subsidiaries, has been guilty of giving or receiving any

unlawful rebates, offsets, or preferences, especially within the last six years; and to report the dates and amounts thereof to the Senate for its information in case the commission finds that such unlawful rebates, offsets, or preferences have been given or received.

It appears that one David H. Lamar and one William H. Green had claimed to be in possession of information showing violations of law on the part of the steel corporation through the receipt by it of secret rebates amounting to millions of dollars, and it is understood that the resolution of the Senate was based upon their representations. It further appears that Mr. Lamar had previously made similar intimations to a member of this commission and had inquired whether the commission would undertake an investigation and permit him to direct the form and manner in which it should be carried on. He was advised that upon being put in possession of any definite information of any such violation of law it would be the duty of the commission to investigate, but that it would do so only in its own way, pursuing such course as the facts disclosed might require. Repeated efforts having failed to elicit any statement from Mr. Lamar in support of his assertions, further conference with him was declined.

After the passage of the resolution by the Senate and after the order of investigation had been entered by the commission, Mr. Lamar and Mr. Green were requested at a personal conference with a member of the commission to state the facts within their knowledge so that the scope of the investigation might be outlined by the commission and affirmative steps taken, through public hearings and by the commission's examiners, to ascertain whether any unlawful rebates and preferences had been received by the steel corporation or by any of its subsidiary companies. But they declined to reveal their information except at a public hearing. They were accordingly served with subpoenas and a public hearing was had on March 3, 1914, Mr. Green being first sworn and called as a witness. The questions put to him at once developed the fact that he had not been a student of transportation matters; that he had attended some of the hearings before the so-called Stanley committee of the House of Representatives, the report of which he had read; that he had also read reports of the bureau of corporations and of this commission in which matters relating to the steel corporation were considered; that he had also examined the record in the government's suit to dissolve the steel corporation; but that he had no independent information, or indeed any information respecting the affairs of the steel corporation and its subsidiaries that was not already of public record in one form or another. Having referred during his testimony to an individual who was in possession of facts not heretofore known, he at first declined to name him, but being required to state who he was he finally named Mr. Lamar.

Mr. Lamar was then called as a witness and, being put under oath, was subjected to examination as to his information about the relations of the steel corporation with the railroads of the country. His testimony shows that he knew nothing that was not already generally known to the public, and that such information as he had was of a perfunctory and superficial nature and had been derived from reading the reports of various public bodies, and especially of this commission, in which the affairs of the steel corporation are discussed. He named several of the subsidiaries of the steel corporation and asserted that "offsets," by which it is understood he meant rebates, had been received from the carriers by the steel corporation in the form of dividends on its holdings of stock in these companies, the stock being based, as he asserted, upon an entirely fictitious valuation.

In *Pittsburgh Steel Co. v. L. S. & M. S. Ry. Co.*, 27 I. C. C., 173; *Vulcan Iron Works Co. v. A. T. & S. F. Ry. Co.*, 27 I. C. C., 468; *Industrial Railways case*, 29 I. C. C., 212, 32 I. C. C., 129; *Coal and Oil Investigation*, 31 I. C. C., 193; *Lum v. G. N. Ry. Co.*, 33 I. C. C., 541; and *Joint Rates with the Birmingham Southern R. R. Co.*, 32 I. C. C., 110, the relations of the steel corporation to various of its subsidiary railroad and steamship companies have been made a matter of public record. An even more complete record of all such facts has been made in the

proceeding by the government, heretofore mentioned, in which it was sought to dissolve the United States Steel Corporation under the so-called anti-trust law. *United States v. United States Steel Corporation*, 223 Fed., 55. The commissioner of corporations has also made an extended investigation, the results of which are incorporated in three printed volumes entitled "Report of the Commissioner of Corporations on the Steel Industry."

The commission comes into constant contact with the records and accounts of railroads and other public carriers through its examiners of accounts, and has reason to believe that there is no basis for the allegation that wholesale rebates have been paid to the steel corporation during the period of six years mentioned in the resolution; apparently in alleging that "offsets" and rebates have been received by the steel corporation during that period the witnesses mentioned had in mind the dividends on the stock of the numerous subsidiary railroad and steamship lines owned by it, and as to this all the facts have been ascertained and are accessible in the various public records just mentioned. Under these circumstances we venture to believe that the resolution of the Senate is sufficiently complied with for all practical purposes by the reference to those investigations in connection with the foregoing statement. (36 I. C. C., 559.)

THE LABOR DEPARTMENT AND THE RAILROADS

By W. L. STODDARD

Washington, December 14, 1915.

Hardly a branch of the Federal Government fails to come into some sort of contact with the railroads. Congress legislates for or against them, the courts decide their cases, a special commission adjusts their rates and values their property, a postmaster general negotiates for payment to them for carrying mails, the military arm of the executive plans for the utilization of the roads in case of war, and this week along comes Secretary of Labor Wm. B. Wilson with several suggestions about the railroads which show that their functions are appreciated from the head of the President's cabinet table down to the foot.

During the last fiscal year, no less than six important railroad cases were adjusted through the mediators of the Labor Department. These cases were those of the freight clerks of the New York, New Haven & Hartford, the car builders of the Pennsylvania Lines West of Pittsburgh, the shopmen of the Seaboard Air Line Railway, the shopmen of the Kansas City Terminal Railway, the clerks of the Chicago & Eastern Illinois, and the terminal clerks of the Southern Railway. In the first named instance it is interesting to know that besides effecting a settlement with the railroad and its freight clerks, the commissioners of mediation, at the request of the railroad company, brought about an arrangement with the officials and employees of the New England Steamship Company whereby conferences are to be had between the company and its clerks over any future differences that may arise between them.

Commenting on this work, Secretary Wilson declares that it has "furnished further proof of the value of the act of Congress under which the department operates in behalf of industrial peace. . . . In administering this authority I have regarded it as contemplating a development of diplomatic duties with reference to labor disputes analogous to those of the Department of State with reference to international controversies."

Secretary Wilson is not content with recounting history—he has a new scheme which involves the railroads. This is to secure from Congress an authorization such that the Interstate Commerce Commission may charge "exceptional rates of railroad fare" so as to enable the department to place the unemployed in employment, particularly in the harvest fields. According to the plan as outlined at considerable length, the idea is that if low railroad rates could be secured, it would be possible to ship large groups of workers to the grain belt at the season when they are most needed there. The department uses the phrase, "labor vacations" to describe the excursions which

it wishes to inaugurate for the relief of the harvest labor situation. An experiment would have been made this year, it seems, but for the expense of transportation.

"Inasmuch as railroads," says the Secretary, "can not give special rates to this department for the promotion of its labor-distribution work without thereby making those rates universal, the department found it impossible to arrange for transporting workers on practicable terms, no matter how willing the railroads themselves might have been to co-operate. This is one of the reasons the department is asking in its recommendations for an amendment to the interstate commerce law enabling the commission in its discretion to approve such special arrangements as the department may find it possible to make between itself and railroad companies for the transportation of workers under its official charge or guidance."

It is expected that a bill will be introduced into Congress embodying the department's suggestions.

Also of interest to the railroads in the Labor Department's report is the request for legislation for the utilization of large areas of land hitherto held by the land-grant railroads, but now, under a decision of the Supreme Court, about to return to the Government. This decision both empowered and obligated Congress to treat with the land-grant railroads regarding the terms of the restoration of the very extensive tracts said to be easily available for farming. In these areas the Labor Department sees a possible outlet for the unemployed, and to this end quite an elaborate scheme has been drawn up, the fundamental idea being to stimulate "back-to-the-land" movement for the relief of congestion in the cities and for the revival of the old era of homesteading.

Up to the present writing Congress has given little promise that it will tackle railroad legislation, or any legislation at all, till after the Christmas recess. Not much hope is held out by leaders at the Capitol for any enactments except appropriations and national defense bills. Some incline to make an exception of the Administration's shipping bill. But in general it is true that few believe that even a small percentage of the many departmental suggestions and recommendations will be considered by Congress with the attention that they deserve.

The personnel of the three Senate Committees which have to do with railroads, as announced early this week, is as follows:

On Railroads: Messrs. Phelan (chairman); Reed, Smith, of Arizona; Williams, Smith of South Carolina; Lewis, Oliver, Norris, Goff, du Pont, and Clark of Wyoming.

On Pacific Railroads: Messrs. Brandegee (chairman); Callinger, McCumber, Jones, Townsend, Shively, Reed, Stone, Johnson of South Dakota, Robinson and Thomas.

On Interstate Commerce: Messrs. Newlands (chairman); Smith of South Carolina, Pomerene, Myers, Robinson, Saulsbury, Thompson, Lewis, Gore, Underwood, Clapp, Cummins, Oliver, Lippitt, Townsend, La Follette and Poindexter.

FOUR-WHEEL TRUCKS FOR PASSENGER CARS

The paper on four-wheel trucks for passenger cars, which was presented at the annual meeting of the American Society of Mechanical Engineers last week by Roy V. Wright, was discussed by several members. An abstract of the paper appeared in the *Railway Age Gazette* of December 3, 1915, page 1055. Extracts from the more important parts of the discussion follow:

C. D. Young, Pennsylvania Railroad.—The railroads have been too prone in recent years to use six-wheel trucks, based upon their experience with wooden trucks. Due to the flexure in these trucks, it was necessary to go to the six-wheel truck, simply on account of the wheel load. Obviously, as far as cost, and probably maintenance, is concerned, due to the fewer parts, the four-wheel truck is preferable to the six-wheel truck, provided it gives satisfactory service. With the advent of the steel truck, I believe that the total weight of the car which will be satisfactorily carried on the four-wheel truck can be materially increased. The practicability of this is proved by

the use of four-wheel trucks under, say, 98 per cent of the heavy passenger locomotive tenders in this country.

Axle loads as high as 45,000 lb. are permitted on passenger tenders, yet when we design a passenger car it is with fear and trembling that we put 31,000 lb. on the same axle.

In order to ascertain what effect on the train's resistance the two extra axles of the six-wheel truck would have we made three round trips each, with a dynamometer car on a ten-car train, using four-wheel trucks, and a ten-car train using six-wheel trucks, the car bodies being the same in both trains. The difference in total weight per car was due entirely to the difference in weight of the trucks, the cars with six-wheel trucks weighing 66 tons and those with four-wheel trucks weighing 59 tons. The tests indicated that the only material difference in resistance was due entirely to the difference in weight of the vehicles. With the cars in question we would have the same resistance in 13 cars with six-wheel trucks as would be offered by 14 cars, with four-wheel trucks.

The development of the clasp brake outlined in the paper was the result of observation of the clasp brakes used on the Philadelphia & Reading. They were tested in 1912, a complete report of the tests already having been made to the American Society of Mechanical Engineers by S. W. Dudley, of the Westinghouse Air Brake Company.* The single shoe brake had a total weight of 3,682 lb. per car, and the movable parts weighed 3,084 lb. The clasp brake had a total weight of 4,433 lb. per car, the movable parts weighing 2,852 lb., showing an increase in total weight of the clasp brakes of 24 per cent, whereas there is a decrease in the weight of the movable parts of the clasp brakes of 8 per cent. It was developed in our brake tests that it was desirable to have as low weight in the moving parts of the brake rigging as possible, to overcome the effect of inertia, for obviously the heavier the moving parts the more inertia and the longer time it takes to get full braking pressure at the wheel with a given pressure in the cylinder. By reducing the weight of the parts of the clasp brake we therefore have the right to expect that we develop the full braking power slightly quicker than we do on the single-brake car.

At sixty miles an hour, with 125 per cent nominal braking power, the clasp brake car made a stop in the brake shoe tests in 808 feet, which I believe is the shortest stop ever made on a passenger car under that braking power. The corresponding length of stop with single shoes is about 1,250 feet, showing a distinct gain in the length of stop by the use of two shoes per wheel, with an increase in the total weight of the brake rigging of only about 24 per cent.

The use of the clasp brake is economical in shoe brake material. We have recently made a series of road tests of brake shoes, considering the wear under single and clasp brake conditions. On the five different runs on which the test was made the clasp brake shows a saving in brake shoe material of about 30 per cent as compared with the single brake.

S. G. Thomson.—The Philadelphia & Reading has had one hundred cars equipped with clasp brakes in service for a number of years. The brake is very highly efficient; the stops with the clasp brake seem to be very much shorter than where the higher pressures are used to get nearly equal braking power.

G. R. Henderson.—It is well known that the Pennsylvania track is nearly perfect and it is a question whether the Pennsylvania four-wheel passenger trucks would give satisfactory service on average track with the loads which they now carry. The abandonment of the equalizers accounts for considerable saving in weight, as the equalizers and spring seats are quite massive for heavy cars. It is still the practice of many roads to use equalizers under tenders of passenger locomotives and also under high speed electric cars, and it is an interesting question as to just how far we can go in abandoning them and still not interfere with the comfort of the passengers. The condition of the track is a very important factor and should not be overlooked when considering this question.

*See *Railway Age Gazette*, February 13, 1914, page 311; also February 20, 1914, page 352.

Six-wheel trucks have been developed more generally in the West than in the East and it is only in recent years that their use has become general on ordinary passenger coaches. I desire to speak particularly with reference to passenger coaches, not sleeping cars or diners or heavy weight cars.

Some of the reasons why the six-wheel truck was applied to cars which would be considered quite light today were that from 60-lb. to 70-lb. rails with very light gravel ballast, in some cases nothing but gumbo ballast, were used, and further because of the use of cast-iron wheels. At one time the Chicago, Milwaukee & St. Paul was using cast-iron wheels even on parlor cars, these wheels being considered absolutely safe under six-wheel trucks, but not under four-wheel trucks.

Under ordinary conditions of service there is no justification for a six-wheel truck under a suburban car, and yet there are a great number of suburban cars which are running on six-wheel trucks. I will go further. I have never yet seen a 70-ft. car of the ordinary passenger coach type where the six-wheel truck was justified with the track we have today.

The following instance is given because of its bearing upon the difficulty from hot boxes. On a certain railroad, where, from the weight point of view, the 5 in. by 9 in. journal was perfectly satisfactory, and they were maintaining their journals in good shape, they were having trouble from hot boxes. They substituted the next larger M. C. B. axle, and still had trouble from hot boxes. An analysis of the situation brought out the fact that with the new form of high-speed brake the pressure with one shoe per wheel was such that it caused the brass to tilt and prevented the proper contact on the journal. When the clasp brake was applied no trouble was experienced with the 5 in. by 9 in. journal.

Mr. Pomeroy presented data showing the weights of a number of typical four-wheel and six-wheel trucks, the former varying from 26,400 lb. per car for 5 in. by 9 in. journals, to 31,400 lb. per car for 5½ in. by 10 in. journals and the latter varying from 41,200 lb. to 45,900 lb. per car. Using an average weight of 27,000 lb. per car for the four-wheel trucks he called attention to the saving in weight which could have been effected on a number of coaches with six-wheel trucks now in service, had four-wheel trucks been used.

S. G. Thomson.—We made some tests on the Atlantic City Railroad to determine the cause of hot boxes in very high speed service, up to 80 or 90 miles an hour on some parts of the road. We took some temperature readings of the boxes and were led to believe that there was not much of a film of oil between the journals and brasses. The trains would come into the terminal with the boxes almost at the flashing point. In the rush season we had to turn these trains back on the reverse trip at once, and no doubt the accumulated heat in the wheels and journals had something to do with the hot boxes on the way back. We ran these trains sometimes six trips during a day and occasionally the boxes would heat up, without any apparent reason, having had careful attention at both ends of the route on all trips. The cars were all-steel, weighing about 118,000 lb., and in my judgment were about at the limit for the four-wheel truck for that speed. We took the same cars on our New York division, where we have a couple of stops, and do not run at such high speeds, and they gave us no trouble whatever. The speed seems to be a factor in the question of using the four-wheel truck, and when our last cars were designed we considered very seriously the use of six-wheel trucks. We concluded to stick to the four-wheel truck and have done so with fairly good results.

G. W. Rink (C. R. R. of N. J.).—I would like to ask Mr. Thomson whether it was with the type of truck with the springs directly over the journal boxes that the trouble with hot boxes occurred. We had a few cars built with trucks of that type, and eventually went to the one-piece Commonwealth truck, because of trouble from hot bearings. On the trucks without equalizers, having the coil springs placed directly over the journal boxes, there is a tendency for the boxes to tilt and bind in the pedestal, producing uneven distribution of bearing pressure and wearing the box flanges. These trucks weighed 15,200 lb.

each and the Commonwealth trucks, which we now use, weigh 17,000 lb. each. Both types of trucks have clasp brakes, with beams across the truck.

S. G. Thomson.—The trucks we made our test on were not the ones with the springs over the journal boxes, although that type has given us more trouble than the other type.

INCREASES ALLOWED IN WESTERN PASSENGER FARES

The Interstate Commerce Commission, in a decision given out last Monday, holds that the carriers in western territory have justified certain increases in their interstate passenger fares, but the increases approved are not as great as those proposed. The decision appears in 37 I. C. C. 1 and is rendered "by the commission." Briefly, the commission's findings are as follows:

The carriers are allowed to increase from 2 cents to 2½ cents a mile their interstate fares in Illinois; Wisconsin, the upper peninsula of Michigan, Minnesota, Iowa, Nebraska, Missouri north of the Missouri river and in Kansas on and north of the main line of the Union Pacific from Kansas City to the Colorado state line. The tariffs had proposed rates of 2½ cents.

In Missouri south of the Missouri river and in Kansas south of the Union Pacific, an increase from 2 cents to 3 cents a mile is not found justified, but a rate of 2.6 cents is allowed.

Proposed increased fares from points in the territory in which these fares are authorized to points on the main lines of the carriers in California, Utah, Nevada, Colorado, Wyoming, Arizona, New Mexico, Arkansas, Oklahoma and Texas are held not justified in those instances where such proposed increases result in higher fares than would be obtained by using for the construction of such fares the bases now authorized in Michigan, Illinois, Wisconsin, Kansas, Minnesota, Iowa, Nebraska, and Missouri, and a basis of 2½ cents a mile in the states of North and South Dakota, and a basis of 3 cents a mile in the states south and west thereof.

Proposed increased charges for mileage tickets in the territory north of the Missouri river in Missouri and on and north of the main line of the Union Pacific in Kansas to 2½ cents a mile, and in territory south of the Missouri River in Missouri and the main line of the Union Pacific Railroad in Kansas to 2½ cents a mile are found justified.

Proposed increased fares from points in Michigan, upper peninsula; Illinois, Iowa, Minnesota, Wisconsin, Nebraska, Missouri and Kansas, to points in states east thereof, which result from the construction of such fares by the use of the bases herein found reasonable and the use of the existing fares in eastern territory are held to be justified.

The increased tariffs were filed to become effective on or about March 1, 1915, but were suspended until June 29, 1915, and subsequently resuspended until December 29, 1915.

This case may be considered as in large part complementary to the 1915 Western Rate Advance Case, 35 I. C. C., 497.*

To the 41 roads concerning which testimony was developed by the carriers in the freight case there were added six other roads, the Great Northern, Northern Pacific, Union Pacific, Toledo, Peoria & Western, Duluth, South Shore & Atlantic and the Texas Midland, and one road, the Chicago, Indiana & Southern, has been eliminated, for the reason that interstate fares on this line have been recently increased. Some of the railroads included in the 46 roads or systems lie largely or wholly without the territory in which the increases in basing fares are sought.

In the decision considerable attention is paid to the data used in the Western freight rate decision, the figures for the 41 roads being revised for the 46 roads and reference being made to the roads in group in particular. Increase in cost of operation and decrease in income for the past 12 years are set forth.

The evidence of both carriers and protestants is adduced to show an increase in the ratio of operating expenses to operating revenue, a rising scale of taxes and diminished compensation for service as measured by the average return per ton-mile or the average return per passenger-mile.

*Abstracted in the *Railway Age Gazette* of August 13, 1915, page 285.

SEPARATION OF EXPENSES BETWEEN FREIGHT AND PASSENGER

The separation of maintenance of equipment, transportation and traffic expenses, as between passenger and freight, presents no insurmountable difficulties. The separation of the expenses incident to the maintenance of way and structures, however, is more difficult. The weight and length of freight trains necessitate a certain degree of compactness of roadbed, weight of rail, strength and stability of bridges, culverts and other structures. The weight and speed of passenger trains have also necessitated in the interest of safety a higher degree of excellence as indicated in the strengthening of track structures, and a certain higher degree of upkeep of the track and structures, while both alike have induced the installation of block signals. The maintenance of way and structures expenses are large and form a great proportion of the total expenses. * * * To this problem a large part of the testimony of both carriers and protestants has been directed.

One of the interrogatories sent out by the commission inquired as to methods used by each carrier in the separation of passenger and freight expenses. The carriers were invited to make this apportionment for 1913 and 1914. Replies were received from 32 carriers making the apportionment for 1914; and 28 also made the apportionment for 1913.

We shall discuss first the method proposed by the carriers for the apportionment of these expenses. The commission here reproduces pages 67 and 68 of Exhibit No. 1 filed by L. E. Wettling, who was a witness for the carriers in this case as

WETTLING EXHIBIT NO. 1, 46 ROADS		
Operating expenses	Per cent freight	Per cent passenger
Basis I:		
Maintenance of way and structures.....	56.23	43.77
Total operating expenses.....	66.90	33.10
Basis II:		
Maintenance of way and structures.....	54.89	45.11
Total operating expenses.....	66.62	33.38
Basis III:		
Maintenance of way and structures.....	56.74	43.26
Total operating expenses.....	66.97	33.03
Basis IV:		
Maintenance of way and structures.....	63.17	36.83
Total operating expenses.....	68.26	31.74
Basis V:		
Maintenance of way and structures.....	58.62	41.38
Total operating expenses.....	67.35	32.65
Basis VI:		
Maintenance of way and structures.....	57.93	42.07
Total operating expenses.....	67.22	32.78

well as in the freight case. The table herewith gives the several bases used in the apportionment and the resulting per cents for maintenance and total operating expenses respectively.

The first basis shown is that ordinarily used by these carriers in the division of maintenance of way expense accounts for their own purposes. Basis 2 rests on the claim that the greater speed of the passenger trains creates a greater degree of wear upon the track and other structures. Inasmuch as this greater speed necessitates more power it is asserted that the weights of the passenger locomotives bear some direct relation to both the weight and the speed of the trains they draw. The locomotive ton-mile therefore to a certain extent measures the work done by the engines in each class of service, and the wear on track and structures. There is, however, a large proportion of the expenses incident to the maintenance of way and structures that is influenced only to a small extent and certain expenses are not influenced at all by the weight and speed of the trains that pass over the track. The action of the elements and deterioration of materials will go on whether trains pass over the tracks or not. It is uncertain how much of any particular item of expense is due to action of the elements and how much to wear. Various assumptions are indulged, as that 60, 70 or 80 per cent of such expenses are due to action of the elements and the remainder to wear. These assumptions rest on uncertain ground.

The testimony of a number of operating and accounting officers of long experience supports the locomotive ton-mile method as in their judgment the most logical and practical method for the division of these expenses. The results of apportionments

upon this basis compare closely with the results obtained by the use of basis No. 3, shown on the same exhibit. This basis proposed the division of the maintenance of way and structures expenses between passenger and freight in the proportion which the revenue passenger train-miles bear to the revenue freight train-miles. This basis may be said to rest in the main on the assumption that these expenses should be divided according to the use that is made of the track. It does not directly take account of the fact that passenger trains move faster than freight trains, nor does it take account of the fact that freight trains are heavier and longer than passenger trains.

Basis No. 4 is an attempt to separate these expenses between passenger and freight upon the proportion existing between the direct train costs as represented by repairs to locomotives, fuel, water, lubricants and supplies for trains and the wages of enginemen and trainmen.

Basis No. 5 is the same as the engine ton-mile basis except that it includes a proper proportion of switch or yard engine ton-miles, while basis No. 6 is the average of the five foregoing bases.

But little testimony was directed to support basis 4. Bases 2, 3 and 5 were criticised by protestants upon the ground that the results thereby reached vary so widely from the division of the expenses which are directly allocated. It may be said that practically all of the maintenance of equipment, transportation, traffic and general expenses are either directly allocated or no material difference of opinion appears to exist concerning their proper division. These expenses assignable to the passenger service are approximately 30 per cent of the total expense included in these three divisions, while on the revenue train-mile or the locomotive ton-mile method the amount of expenses of maintenance for ways and structures assignable to the passenger service is usually more than 40 per cent of the total of these expenses. It is asserted that these unallocated expenses of maintenance of way and structures should be divided between passenger and freight upon some basis which more nearly accords with the known ratio that exists between the other expenses. . . . We are not prepared to approve in its entirety any of the methods offered.

The protestants through their witnesses, Hillman and Warren, have made a division of the operating expenses for 1913 and 1914 on the Chicago & North Western and a number of other roads. Six different bases are presented. The first method uses the product of the total weight of passenger trains multiplied by the distance moved as compared with the product of the total weight of freight trains times the distance moved. This method assumes the proper relation between these expenses to be due solely to the weight and distance moved. In other words, the total tons moved 1 mile in a passenger train is compared with the total tons moved 1 mile in a freight train. The second method is the locomotive ton-mile method as used by the carriers and heretofore explained. The third method is called the locomotive tractive power method; the sum of the products of the tractive powers of the locomotives used in the passenger service multiplied by the number of miles moved is compared with the result obtained by a like computation for the freight service. Inasmuch as the tractive powers of locomotives are nearly proportional to their weights, the results derived by this method in most instances are not materially different from those derived by the locomotive ton-mile method.

The fourth method is called the car-mile method; it divides these common expenses on the ratio that exists between the total passenger car-miles and the total freight car-miles.

The fifth method proceeds to make certain assumptions that of some of these expenses one part constituting an assumed proportion of the total expenses is due to action of the elements and the balance is due to wear. The expense due to wear is distributed upon a gross ton-mile basis and expense due to weather is distributed on a car-mile basis.

The sixth method entertains the same presumptions as to the amount due to wear and weather of the various items and proceeds to distribute the wear on a gross ton-mile basis as in

the fifth method, but the expense due to weather is distributed upon a net ton-mile basis.

Herewith is shown the results of the application of these six methods to the maintenance of way and structures expenses on the Chicago & North Western for 1913. The total amount of these maintenance of way and structures expenses for 1913 was \$11,501,186.

Protestants; assignment of M. W. expenses to passenger service, C. & N. W., 1913.

Method of assignment.	Portion charged to passenger service.	Per cent.
Gross weight basis.....	\$3,299,072	28.68
Locomotive ton-mile basis.....	4,666,768	40.58
Locomotive tractive power basis.....	4,719,703	41.04
Car-mile basis.....	2,475,570	21.52
Wear on gross ton-mile, weather on car-mile basis.....	2,771,701	24.10
Wear on gross ton-mile, weather on net ton-mile basis.....	1,961,269	17.05

Out of a total of \$45,158,736 for transportation, traffic, and maintenance of equipment expenses for the year 1913 there was assigned to the passenger business on the gross weight basis \$13,258,743, or 29.34 per cent. Approximately the same proportion of the expenses under these three general accounts was assigned to the passenger business under the remaining five methods. There was no material difference of opinion between carriers and protestants regarding the division of expenses in these three groups.

Methods 5 and 6 rest on unverified assumptions concerning the amount of expenses in the various items due to the action of the elements. This record is not convincing as to the accuracy of these various assumptions. Method No. 4, the car-mile basis, takes no account of speed, and would charge to the average freight train, say 24 cars, four times as much of the maintenance of way and structures expenses as to the average passenger train, say 6 cars, although the service performed by track and structures in carrying the passenger train may be as great or nearly as great as that performed in carrying the freight train.

Methods 2 and 3 may be considered as the methods advocated by the carriers. Method No. 1 is urged by protestants. We have some difficulty in accepting the locomotive ton-mile method, for while it does to a certain extent give consideration to the speed of the trains as well as to their weight, we are not convinced that this is in all respects more certain in its foundation than is the gross ton-mile method.

These expenses for maintenance of way and structures should be divided between passenger and freight as nearly as possible upon the basis of their respective utilization of this part of the plant. What is the best measure that can be obtained of this utilization of the track by these respective services? In the absence of any certainty that the scale of passenger fares and that of freight rates is properly proportioned, the revenue derived from the respective services can not form a fair measure of this utilization. The absence of such a known relation between these charges, however, leads to an examination of certain expenses as probably indicative of the utilization of the track and structures. The fuel consumed by road locomotives; the lubricants, water, and other supplies for these locomotives; the train supplies; the wages of trainmen and enginemen, are all separated between passenger and freight, and each by itself, or the aggregate of all will constitute an index of the utilization of the tracks by these two branches of the service. Other accounts such as the repairs to locomotives might also be regarded as indicative of the proper apportionment. This expense, however, is not segregated as between road and yard locomotives. We shall, therefore, for the purpose of obtaining a basis for division, regard only the items which are shown below as per our classification of operating expenses in effect during the fiscal year ended June 30, 1914.

80. Road enginemen.	85. Other supplies for road locomotives.
82. Fuel for road locomotives.	86. Road trainmen.
83. Water for road locomotives.	87. Train supplies and expenses.
84. Lubricants for road locomotives.	

The common expenses are divided on this method between the two services in the proportion of the actual division of the seven preceding accounts. Our decision to use this method in this case must not be regarded as conclusive on our part of

the method that should ultimately be used for the division of maintenance of way and structures expenses between passenger and freight. The objections that may be urged against the direct charge method are known and appreciated.

From the 32 carriers which in answer to our interrogatories supplied information concerning methods of division of expenses between passenger and freight for 1914 we have eliminated those whose lines lie wholly or almost entirely without the territory in which the principal increases are proposed. There are 20 of these railroads whose lines lie in territory which would be directly affected by the proposed increases. For the purposes of this case the divisions furnished by carriers of all of the operating expenses have been used except those due to maintenance of way and structures. The maintenance of way and structures expenses have been divided between passenger and freight upon the basis of the allocated train expenses named above. (A table showing the results of this method for each of the 20 roads involved and a comparison of these results with the results of the division furnished by the carriers for the year 1914 follows. The totals in this table for 20 roads and 80,159 miles are given herewith.)

The record does not indicate what proportion of the total maintenance of way and structures expenses are due to the upkeep of yards, but it is easy to determine how the results shown in the above table are affected by dividing these yard maintenance expenses upon the basis of the direct yard costs. Let it be assumed, for example, that 10 per cent of the maintenance of way and structures expenses were incurred in the upkeep of the yards. It follows then that the correct formula representing the per cent of total maintenance of way expenses assignable to the passenger traffic is 0.9 of 38.5 per cent plus 0.1 of 11 per cent, or 35.75 per cent. Since on these roads the maintenance of way and structures expenses constitute almost exactly 20 per cent of the total operating expenses, it is evident that the proportion of total operating expenses which may have been improperly charged to the passenger traffic is 20 per cent of the difference between 38.5 and 35.75 per cent, or 0.55 per cent. The total operating expenses of these roads for the year 1914 were approximately \$616,000,000. A variation in the assignment of these expenses of 0.55 per cent amounts to \$3,388,000. Under the method used by witness Wettling, of dividing the property account, this affects the amount of cost of road and equipment assignable to the passenger traffic by \$27,433,000, and affects the percentage of net income from the passenger traffic to cost of property devoted to the passenger traffic by 0.29 in the percentage. It also affects the percentage of income derived from the freight business to assumed property investment by 0.15 in the percentage. The passenger traffic on these roads earns 3.39 per cent upon the value of the property assumed to be devoted to the passenger traffic, which, in round numbers, is \$1,465,000,000; while the freight traffic earns 5.07 per cent upon the value of the property assumed to be devoted to the freight traffic, which, in round numbers, is \$3,157,000,000. To allow the passenger traffic to earn the same ratio of return upon investment as the freight traffic the passenger earnings of these roads would have to be increased by \$24,600,000. If, however, these yard maintenance costs are as much as 10 per cent of the total cost of maintenance of way and structures it would then appear that the passenger traffic is earning 3.68 per cent on the cost of the property assumed to be devoted to the passenger traffic, which, in round numbers, would be \$1,438,000,000; while the freight traffic is earning 4.92 per cent on the cost of the property assumed to be devoted to the freight traffic. In order to permit the passenger traffic to earn the same percentage upon the investment as the freight traffic, it would require an increase in net income from the passenger traffic of approximately \$18,000,000.

BOOK COST OF ROAD AND EQUIPMENT DEVOTED TO PASSENGER SERVICE

The book cost of that portion of the road and equipment which is devoted to the passenger traffic has been assumed by the carriers to be the same proportion of the entire book cost as

the passenger operating expenses for the year 1914 are of the entire operating expenses. The liability of error in accepting the book cost of property as the basis for the computation of return on investment is fully realized. This arbitrary method of assignment of this or that portion of the book cost of the entire property to passenger traffic is also quite unsatisfactory. The carriers have assumed that the expenses chargeable to each of the services for the year 1914 form a measure of the value of the property devoted to such services. If, for example, the passenger operating expenses for the year 1914 were 30 per cent of the total expenses, 30 per cent of the book cost of the property is assigned to the passenger service.

The 20 lines here used have a large percentage of their mileage in territory outside the region principally affected by these increases and passing through territory where higher fares apply. This is notably true of the Atchison, Topeka & Santa Fe, Great Northern, Northern Pacific, Illinois Central and the Chicago, Milwaukee & St. Paul railroads. In the territory principally affected by these increases the carriers are seeking to increase their fares by approximately 25 per cent. The total gross passenger revenue of the 20 lines we have here taken for the year 1914 was approximately \$205,000,000, while the carriers' estimated maximum increase accruing to these lines from the increases proposed is not quite \$16,000,000, or something less than 8 per cent of their gross passenger revenue. Should these increases be permitted and the increased fares not result in any appreciable diminution in the number of passengers who travel in and through that territory, the effect would be to raise the percentage earned upon the net cost of property assumed to be devoted to passenger service by approximately 1 per cent.

DIVISION OF EXPENSES BETWEEN INTERSTATE AND INTRASTATE SERVICE

Protestants complain that the carriers have made no attempt to segregate the costs of doing the intrastate passenger service from the interstate service. The intrastate passenger service in these states is approximately 50 per cent of the total, and if this service is much more expensive than the interstate it would follow that whereas the passenger service as a whole paid from 3.39 to 3.68 per cent upon the cost of road and equipment devoted to passenger service in 1914, the interstate passenger service paid a greater per cent of return. There is no definite and convincing proof that the intrastate passenger service is much more expensive than the interstate. The intrastate and interstate passenger service is intermingled. It is largely done upon the same trains over the same roadbed, with the aid of the same employees. There are, it is true, two terminals involved in all state journeys and usually only one in any one state in an interstate journey. But the average haul for the interstate passenger is greater, and the character of the equipment used in the interstate business will average somewhat higher than in the strictly intrastate business.

The task in this case is not the fixing of fares for each kind of passenger traffic. A different and more elaborate investigation would be necessary if an attempt were being made to ascertain the appropriate relation between the various classes of passenger traffic, such as commutation, Pullman, local and through trains, long hauls and short hauls. The question here is whether an increase in the passenger fares has been justified.

Upon the whole record the carriers have sustained their contention that the business done by passenger train service is less profitable on the whole than is the freight service in this territory. A suggestion has been made that the mail service and express service may not be carrying their full proportion of the total expenses of operation of these properties. No evidence was offered, however, to show that this is a fact.

The report goes on to discuss possible economies in passenger service, quoting data presented by the carriers as to costs, and concludes that:

"Substantial improvements in the passenger service have been made since 1900 at large expense to carriers, resulting in a greater degree of comfort, convenience and safety to the traveling public.

"The conditions under which the passenger service is now performed do not admit of all the corresponding economies in operation that have been effected in the freight service.

"The increased cost of service due to greater costs for labor, materials and taxes not offset by corresponding economies which are practicable in operation is entitled to consideration.

"The passenger business in the territory principally affected by the proposed increases is less profitable than the freight business.

"The basis for the fares now applied for the transportation of interstate passengers is less in this territory than in the states south, east and west thereof.

"There is some justification for a lower basis of fares in that territory than in the states that are west and south thereof."

This increased revenue which apparently should come from the passenger traffic should not, however, be altogether imposed upon the interstate traffic. Manifestly a person journeying by rail within the boundaries of a state cannot expect to travel at the expense, in any degree, of the interstate passenger. The revenue of respondents from intrastate passenger traffic within these states is approximately 96 per cent of that from the interstate traffic. While we should permit reasonable interstate fares we cannot sanction fares that are higher than are reasonable for the service performed because intrastate fares are alleged or shown to be unduly low.

It is contended on behalf of some of the protestants that if a carrier obtains a fair return upon the whole of its business it cannot reasonably complain of a public policy affording cheap travel . . . Whatever may be said in support of this policy we can find no justification in approving it in connection with interstate passenger service under a statute which does not authorize us to prescribe rates or fares less than are reasonable for the service rendered. These words clearly point to a service which is to be rendered in consideration of the charge. We think, therefore, that the principle embodied in the law is that each class of service should bear reasonable charges therefor. . . .

Cognizant of the infirmities of alleged book value as indicative of actual investment . . . we have felt justified in using so-called book value as a basis of showing tendencies as to costs of service and net results. . . . The position that each service should be self-supporting seems substantiated by the Supreme Court of the United States. *Norfolk & Western Ry. Co. v. Conley et al.*, 236 U. S., 604; *Northern Pacific Ry. Co. v. North Dakota*, 236 U. S., 585.

Where intrastate fares in the territory principally affected by the proposed increases are compared with similar fares elsewhere it is found: First, that in practically all of the states where increases are proposed the state controlled fares are 2 cents a mile; second, that in only four or five other states, to wit, Ohio, Indiana, Illinois, Arkansas and Oklahoma, at the time of the hearing was a similarly low fare in force; third, that in Rhode Island and New York the fares range from 2 cents to 2½ cents, with a very high density of passenger traffic; that in West Virginia, Alabama, North Dakota and South Dakota the fare for intrastate travel is 2½ cents; that in Maine, Massachusetts, Vermont, Connecticut and New Hampshire the state fare ranges from 2 cents to 4 cents; that in Kentucky, Tennessee, Mississippi, Louisiana, Washington, Texas, Montana and more recently in Arkansas by reason of injunctions of a federal court, the state fare is 3 cents; that in the Carolinas, Georgia and Florida the fare is in no case less than 2½ cents a mile; and that in California, Colorado, Oregon, Utah, Idaho, Arizona, Wyoming and Nevada the range is from 3 cents to 6 cents. . . .

Commissioner Hall dissents.

ELECTRIC HEADLIGHT CASE

With the filing of the reply brief by the railroads on Tuesday, December 14, the long-fought "electric headlight case" was closed so far as the railroads are concerned. The labor union interests have until December 24 to file a reply brief and the case will then be submitted for decision to the Interstate Commerce Commission.

Labor union leaders have conducted an active campaign to induce the Interstate Commerce Commission to adopt a rule that would force the removal of all acetylene and oil-burning headlights and install a high-power electric "searchlight" on every locomotive in the country. The railroad representatives have strenuously fought the sweeping change provided by such a universal rule, contending that the dazzling glare of the electric "searchlights" is confusing and dangerous in railroad operation on double-track and four-track lines, where many fast trains are constantly passing one another, where operation now is entirely by block systems of colored signal lights, and where traffic is exceedingly dense. The high-power electric headlights are being used on parts of some western and southern single-track roads, but the big eastern lines operating multiple-track systems have refrained from installing them after extensive tests and now resist the labor leaders' effort to force their adoption by a governmental rule.

Operating experts are a unit in opposing the "searchlights" for dense traffic. So unanimous has been their opposition that 156 railroads, embracing 215,000 miles of trackage, were combined in the case before the Interstate Commerce Commission, which heard oral arguments on December 4. Extensive evidence to support their claim that the electric "searchlights" not only are *not* safety devices, as claimed by the labor leaders, but that they have repeatedly caused accidents and failed to prevent wrecks, and that they are positively dangerous on the multiple-track eastern lines, was introduced by the counsel for the railroads. This mass of evidence included testimony covering tests and experiments conducted over a period of more than five years by the Master Mechanics' Association, and showed that the high-intensity lights caused misreading of signal lights, creating "phantom" or false signals by reflection from roundels; also failure by engineers to catch classification signals. They also seriously confuse and blind engineers whenever trains bearing the searchlights approach one another, preventing observers from seeing reliably when caught between the intense opposing light beams. The railroads' counsel also cited the conclusions of the commissioners after extensive tests by the Wisconsin Railroad Commission, which supported their contentions, and enumerated many cases taken from the accident reports of the Interstate Commerce Commission itself.

Charles C. Paulding, solicitor of the New York Central lines, has led the fight against the proposed electric headlight rule as chairman of a special committee of counsel including also Stacy B. Lloyd, of the Pennsylvania, and Duane E. Minard, of the Erie.

Chief W. S. Stone, of the Engineers' Brotherhood, and President W. S. Carter, of the Firemen's Brotherhood, have had charge of the campaign for the electric headlights, making personal arguments before the Interstate Commission, submitting signed briefs and examining witnesses. Officially, the electric rule was filed by Frank McManamy, chief inspector of the Division of Locomotive Boilers Inspection of the Federal Government, but the labor leaders carried on the case and not until the final oral arguments did the chief inspector file a brief in support of the rule. Counsel Paulding was granted leave to make further reply to this late brief by Inspector McManamy, which reply has just been filed as the closing paper in the case. In this Messrs. Paulding, Lloyd and Minard merely reply to Mr. McManamy's attack on the good faith of the railroads' opposition.

The issue now submitted lies between two rules, involving also the principle of establishing reliability and definiteness in governmental inspection. The labor leaders' proposed rule provides that "each locomotive shall have a headlight which will enable

persons with normal vision, in the cab of the locomotive, under normal weather conditions, to see a dark object the size of a man for a distance of 1,000 feet ahead of the locomotive."

This language is objected to by the railroads as being utterly indefinite and worthless for the purposes of accurate inspection and for specifications by which to build headlights with certainty that they will fulfill the demand. They claim that the "eye-test" merely assures the necessity of a tremendous and excessive quantity of light, such as only a very high-intensity electric lamp would provide. They advocated an alternate rule providing for a test of headlights by "candle-power" with scientific exactness, at minimums that would not create a dangerous glare nor restrict equipment to electric lamps. The terms "normal vision" and "normal weather" vary with every individual or geographical section, as shown by repeated tests, and are valueless as guides in a legal requirement and for inspection. Many "surprise tests" of enginemen with asserted "normal vision" showed a wide disparity in the distances they could see objects under various conditions of light, color and surroundings.

As many of the government inspectors are members of the union labor organizations which occasionally are in controversy with the railroads on other matters, it is considered important that whatever rule regarding headlights is adopted should be definite and exact enough to make the matter of inspection proof simple and uniform.

Manufacturers of headlight equipment have taken much interest, inasmuch as the adoption of the rule urged by the labor leaders would involve the discarding of a vast number of acetylene and oil lamps and the purchase of electric equipment at an outlay of more than \$6,000,000. At present there are 67,869 locomotive headlights in use in the United States, of which number 42,213 are oil-burning, 2,904 are acetylene, 22,120 are electric arc and 632 are electric incandescent.

The acetylene interests, through the International Acetylene Association, represented by Oscar F. Ostby, were permitted by the Interstate Commerce Commission to intervene in the case, and strongly opposed adoption of the labor leaders' electric rule. It was urged that the acetylene headlights have been used with satisfaction to both railroads and their employees, chiefly in New England, and that "adoption of the rule restricting choice to electric lamps would stifle free competition and create a government-protected monopoly" for the electric manufacturers.

In the vigor of the railroads' rebuttal of the labor leaders' claim that the electric headlight would prove a safety device has been reflected the intense interest and pride in their extensive "safety first" endeavors of recent years, Chief Counsel Paulding contending that the tremendous strides made by the operating officers in safeguarding life and property and reducing the number of accidents, together with the responsibility for safety keenly felt by railroad officials, merits support from the government by leaving questions of operation to their experts when the possible benefits of a sweeping change are, at best, very doubtful.

An early decision in the headlight case is expected.

THE AUSTRALIAN TRANS-CONTINENTAL LINE.—The question of a uniform gage is still receiving attention in Australia and negotiations are proceeding between the South Australian and Western Australia governments with a view to the construction of railways on a 4-ft. 8½-in. gage from Kalgoorlie to Fremantle, and Port Augusta to Adelaide, in order to provide a uniform track between Fremantle and the South Australian capital. It is anticipated that the east-west line will be open to traffic by the end of 1916.

RAILWAY CONSTRUCTION IN INDIA.—The Peuch Valley section of the Itarsi-Nagpur Railway, which is expected to be finished shortly, will open up a valuable coalfield. This branch forms part of a triple project of which the northern section from Itarsi to Amla is now open throughout. As regards the third, or southern section, which is to run from Amla to Nagpur, the length from Pandurnah to Nagpur is expected to be opened for public traffic in October next year, and the length between Amla and Pandurnah some time in April in the year following.

Maintenance of Way Section

Railroads frequently lose property through adverse possession as a result of undisturbed encroachments on the right of way.

Preventing Right of Way Encroachments

These encroachments take various forms, including the shabby hut of the still more shabby squatter, the misplaced fence of the adjacent property owner, or the gradually established traveled way of the trespassing public. To a certain extent the roads may be said to encourage encroachments by failure to give this subject proper attention. The importance of the problem and the relation of the maintenance officer thereto are outlined in an article appearing on another page in this issue. As custodian of the railroad's fixed property, the maintenance officers are charged with the protection of the right of way against encroachments. Being constantly on the ground, the roadmaster and foreman are best able to detect and report encroachments. They can, however, do little without the co-operation of the real estate department in giving them proper records and of the division engineer in thoroughly establishing right of way lines. If records of sales and purchases are not properly indexed, if station maps and right of way maps are not up to date, and if monuments are not established, those charged with the protection of the right of way are handicapped. The situation is more serious in cases where changes of line have destroyed the most authentic tie to the property line, namely, the original center line of the track, or in cities, where property is acquired by lots and blocks in irregular shapes, and particularly where the lines are not established by improvements. Next to the complete monumenting of the property, complete station maps, with adequate ties from all fixed physical features to the right of way lines, are of particular value, but only a more general attention to all phases of the subject will materially reduce the losses to which railroads have been subjected in the past.

The unloading of track materials, particularly for renewals on an operated line, is commonly done in a rather loose and inaccurate fashion. Although it is given careful

The Distribution of Track Materials

and conscientious consideration by some men, the principal tendency is toward speed to the subordination of everything else. There are a number of reasons for this. Roadmasters are admonished continually to release cars as quickly as possible and to reduce work train service to a minimum. On a line with a fairly large traffic the work of unloading materials suffers long delays because of the necessity for work trains to get out of the way of regular traffic, and in consequence an effort is made to unload as much as possible in the short periods of time available between regular trains. Another reason arises from the difficulty of controlling a large gang, composed mainly of foreigners, distributed in a number of cars. It must also be admitted that some men are given to considerable inertia of mind when it comes to making the calculations necessary for the accurate distribution of materials. It cannot be questioned that the per diem on cars and the cost of work train service will assume undue proportions unless watched very closely. However, it is very easy to lose sight of the fact that the cost of rehandling materials along the tracks as a result of improper distribution from cars may also assume undue proportions. Careful comparisons of costs will usually show that it will prove cheaper to hold a work train longer and unload the material where it is to be used than to dump it off in a haphazard manner and use an extra gang in carrying or trucking the material back and forth along the tracks to obtain the desired distribution.

Recent progress in chimney design and construction is described in an article in this issue. No phase of the subject is more

Modern Chimney Construction

notable than the rapid development which has been made in this branch of construction engineering during the last 10 or 15 years. It is not long since chimney design and building were considered entirely within the province of the skilled brick mason or the boiler-maker, and, in consequence, chimneys usually were nothing more than high brick walls or large stove pipes, except in those cases where an architect sought to embellish them with heavy capitals or other ornamentation. To-day chimney design has been placed definitely under the jurisdiction of the engineer and the chimney specialist and the use of scientific principles of design and expert construction methods are almost universal. These things, of course, have resulted in safer chimneys, but the principal gain has been in economy, resulting partially from the healthy competition which exists between the advocates of the various materials used. While the present knowledge of the subject of wind pressure, the all-important item in chimney design, leaves much to be desired, the information available is used to the best advantage and the chimneys of to-day are at least of uniform strength throughout. This has resulted indirectly in improving their appearance, for esthetics are best satisfied in that structure which fulfills its useful purpose in the most direct and obvious manner. Exactly in so far as the advance in the art of construction has made it possible to conform to the theoretically correct outline, has it been possible to obtain the best appearance, and instead of the meaningless imitation of a classic column with a heavy purposeless capital, there has been evolved, unconsciously perhaps, the more graceful chimney of the present.

A common practice in distributing ties for renewal is to unload them along the track by work train in the fall and stack them

Distributing Ties

in piles of 50 to 75 until required. One roadmaster is planning to unload and stock his ties this year on the station grounds, where no work train service will be required. His section forces will then distribute them with motor cars in the spring as desired. He believes that not only will his cost of distribution be no greater with this method, but that he will secure a more uniform tie renewal. With ties stored in piles at intervals along the line, it is entirely natural to expect that the renewals will be made more thoroughly near these storage piles, where the trucking distance is less, while if the ties are distributed by motor car this will not be the result. It will be interesting to note by an examination of the adjoining sections before and after the tie renewals have been completed to what extent this theory will be borne out by the facts.

Differences of opinion are to be expected among any group of men regarding any matter requiring the exercise of mature judgment. In most cases the average of

Limiting Individual Judgment

the opinions of experienced men will not be far wrong, but some individual ideas will be wide of the mark. One of the details affecting the safety of travel regarding which it is difficult to fix an arbitrary limit is the time at which worn rail should be taken out of the track. A similar problem, the effect of errors in solving which are felt directly in financial losses, arises in connection with the renewal of ties. If left to the individual foremen there will be almost as many

standards in regard to these and other details as there are foremen. To escape these variations in practice regarding important matters it is necessary that standards be prepared, that the men may be thoroughly instructed regarding them and that there be sufficient intelligent inspection to see that these standards are observed. The standards will, of course, be prepared by the supervising officer in charge of the department, the judgment of this officer thereby replacing that of the less experienced individual foreman. Such standards should not be carried too far, for it is difficult and unwise, in many instances, to limit the initiative of men directly in charge of work. On the other hand, it is a wise precaution to restrict this initiative where the results of an error in judgment may be serious.

THE QUALIFICATIONS OF A GOOD FLOOR

FLOORS are commonly selected from habit or prejudice rather than from a consideration of the adaptability of the materials to the given situation. No individual type of floor can fulfill all requirements under all circumstances. In fact, no single ideal floor is conceivable, because requirements under different conditions are conflicting. To illustrate, it is always desirable that a floor be economical, durable and easy to repair; under various circumstances it may also be desirable that it be hard, resilient, smooth but not slippery, a non-conductor of heat, non-absorbent, non-resonant, waterproof and fireproof. No floor has all these qualities; neither are they all necessary in any given case. The problem is to determine the desired qualities and then to select the material which possesses them.

There have been many floor failures, some of them the result of poor design and poor workmanship, but many have resulted from improper selection. The fact that one class of floor has been found successful under given conditions does not necessarily prove that it will be a success in different circumstances. On the other hand, one should not form the habit of associating a certain class of material with a certain class of service and leave that material out of consideration for entirely different services.

Having selected the type of floor, it becomes necessary to secure materials of a grade suited to the service to be performed and installed according to approved standards of workmanship. Foundations are frequently a cause of failures of floors, these usually being the result of lack of experience or expert knowledge. The higher cost of the newer types of high-grade floors naturally results in a tendency to substitute cheaper materials or inferior methods. These usually result in failures. All these considerations show beyond question that there is as much need of the services of a competent engineer in the selection, design and supervision of the construction of a floor as in the design and superintendence of the construction of the building of which it is to be a part.

A SYSTEMATIC PROGRAM

MAINTENANCE of way officers are unanimous in the contention that the most successful and economical work is possible only through the consistent prosecution of a well-prepared program throughout the season of good weather. Unfortunately, a number of influences interfere seriously with the efforts of the maintenance department to follow a definite plan of campaign. The effect of commencing the fiscal year on July 1 has been discussed previously in these columns and elsewhere and remains the most important obstacle to efficient track maintenance.

Another obstruction in the way of the proper prosecution of a regular program lies in the vacillating and erratic policies followed on some roads in the conduct of maintenance expenditures after the season has opened. Instead of consistent conduct of the work from month to month, according to the program outlined, frequent changes of policy take place. Orders issued to rush the work faster than the schedule are followed by others cancelling plans, and so on in infinite variety. Aside from the tangible losses accompanying such changes of policy, there is

a loss of esprit de corps, because such changes mean hardships to every member of the force. They work a hardship also on those small contractors who do ditching, bank widening, etc., which is no doubt reflected in the bids which they will tender on subsequent work.

No better example can be used to illustrate this condition than gravel pit operation. Here the same processes are repeated day after day, and with good equipment and a uniform output it is possible to obtain very low production costs. If, however, the men are rushed almost to exhaustion one month in order to obtain a maximum output and the worked on half time the next when the pit is all but shut down, it is impossible to get the best work out of them.

It is to be expected that changes in business conditions, or more particularly, in the current earnings of the railroad, must be considered in apportioning expenditures, especially when conditions have been as abnormal as in the last two years. There can be little question, however, that a too solicitous attention to the monthly showings has a harmful influence, and it has been well said that "the constant use of emergency language is an indication of poor management."

The prolonged reduction of railroad earnings naturally called for material reductions in maintenance expenses, and a number of instances can be cited where railroads have succeeded in making marked reductions in expenses and at the same time have obtained increased efficiency by taking the minor officers, and even the employees, into their confidence and making it clear to them why the curtailment of expenses has been necessary. Granting that a certain amount of fluctuation in the prosecution of the season's work is unavoidable, it would seem that much would be gained by telling the maintenance men definitely why a change in program has been necessary and letting them know, if possible, how long the new policy will remain in effect.

THE WATERPROOFING OF BRIDGES

REVISED specifications for the waterproofing of solid floor railroad bridges appeared in the August, 1915, Proceedings of the American Society of Civil Engineers. The author of these specifications has had extensive experience in this work, and the specifications as they now appear have been subject to some modifications as the result of extensive discussion of the subject by various members of the society in whose proceedings the original draft of the specifications appeared some months ago.

The present state of the art of waterproofing may be considered very largely the result of study and experimentation covering the period of 15 odd years since the introduction of the solid and ballast floor bridge. Waterproofing is not an exact science. Success has come about only through repeated trials and the diligent study of the many failures with which these years of effort have been marked. From time to time the various underlying principles have been discovered and recorded, notably by the engineers who designed and built the structures for the elevation of the many miles of railroad track in Chicago. It was there that much of the pioneer work was done.

Success in waterproofing is attained only by minute attention to details, combined with an accurate and complete trade knowledge. This is in reality a field for the specialist who has a remedy at hand for every contingency. The quality of the materials is important. Nevertheless there are materials on the market which will serve equally well, or nearly so. There is no substitute, however, for the best workmanship available, combined with the most painstaking supervision, and scrupulous care of the completed work until it is fully protected. The needs of good waterproofing must be taken into account in the design of the structure. Drainage in particular must be taken into consideration, and, in fact, all details must be such as to make good workmanship really possible.

Because of the rather extensive use of membrane waterproofing in recent years, a knowledge of the subject should have become pretty generally diffused among the railway engineers

of the country. The observation of not infrequent instances of faulty practice at this late day is therefore somewhat disappointing, but may be explained in each case either by a lack of experience or of adequate knowledge, or by an attempt to accomplish the impossible. These instances of poor practice point to the need of employing an expert or of the engineer in charge becoming thoroughly conversant with the literature on the subject.

Much had been written about waterproofing before the preparation of these specifications. They have the advantage of presenting a concise statement of the salient features, and, while many engineers may differ as to some of the details, there can be little question as to the most important points. The specifications will be read with interest by all who have had anything to do with this perplexing subject.

Letters to the Editor

INCREASING THE SECTION FORCES

PROWERS, Colo.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

In this day of advanced railway work, one of the most serious problems confronting railway managers is the increasing cost of track maintenance. In the past it has been the practice on most roads to put on a number of extra gangs in the spring to make heavy repairs and to do that portion of the track work that the section crews are unable to accomplish. I believe that if the roads would give each section foreman 25 to 30 men in the spring and permit them to do the work necessary on their own sections, they will find that the cost of maintenance will decrease considerably. A section foreman who is interested in his work will do more and better work on his own section than any extra gang foreman will, for in most cases the latter are moving from place to place and they do not take the care with their work that the average section foreman will on his own section.

R. E. PITTS

Section Foreman, Atchison, Topeka & Santa Fe Ry.

NEW BOOKS

Safety Engineering Applied to Scaffolds. 6 in. by 9 in.; 339 pages; 127 illustrations. Bound in cloth. Published by the Travelers' Insurance Company, Hartford, Conn. Price \$3.

Vital statistics available in this country contain little information concerning scaffold accidents, but data gathered by insurance companies from newspaper items show that these accidents are worthy of serious consideration. This book is written as a result of a study of the subject and with the hope that the information it contains will result in the construction of better scaffolds and more safety appliances around construction work. In scope the book is limited to building work, and the treatment is practical rather than scientific, but almost all conceivable types of scaffolds and phase of the subject are covered in detail. The illustrations and the typography deserve special notice.

Elements of Railroad Track and Construction. By Winter L. Wilson, professor of railroad engineering, Lehigh University. Size 5 in. by 7 in., 396 pages, illustrated, bound in cloth. Published by John Wiley & Sons, New York City. Price, \$2.50.

This is a revision of an earlier edition and a large portion has been rewritten. As the book covers the subjects of railroad maintenance, surveying and construction in 400 pages, the treatment is brief. About 100 pages are descriptive of the permanent way. Seventy pages are devoted to turnouts, containing the usual information given in the railroad surveying handbook, with additional descriptive matter on the details of frogs and switches. Considerable portions of the book are grouped

under the headings, Maintenance of Way, and Railroad Construction, and short sections are devoted to sidetracks, yards, terminals, signals, etc.

Practical Surveying. By Ernest McCullough. Size 5 in. by 7 in., 400 pages, illustrated, bound in cloth. Published by D. Van Nostrand Company, New York City. Price \$2.

The object and character of this book are best stated by the author in the preface: "This book is a serious attempt on the part of the author to meet the needs of students whose mathematical preparation does not extend beyond the arithmetic given in the grade schools." As a result, about 100 pages of the book are devoted to elementary algebra and trigonometry. The book may be also said to be a combination of a text on surveying and a field manual, as the chapters on chain surveying, leveling, compass surveying and transit surveying, which comprise the larger part of the book, contain many detailed examples and explanations of field methods known only to the practical surveyor of long experience. Forty pages are devoted to surveying law and practice and 32 pages to what is called engineering surveying. For subjects treated lightly in this chapter, the author refers the reader to other texts. The explanations are given with painstaking care and the language is suited to those for whom the book is intended.

Railway Maintenance Engineering. By William H. Sellev, non-resident lecturer on railway engineering, University of Michigan. Size, 5 in. by 7 in., 360 pages, 194 illustrations, bound in cloth. Published by D. Van Nostrand Company, New York City. Price, \$2.50.

This book is intended primarily for the student and the author states in the preface that it has been prepared from notes used in his classes. However, the frequent references and the extensive bibliography make it a valuable reference book for the maintenance of way officer, especially in view of the author's experience in responsible positions in the engineering department of the Michigan Central. The book treats primarily of materials, devoting 32 pages to ties, 35 pages to rails and their manufacture, 31 pages to miscellaneous track materials, etc., while it gives little information concerning methods of conducting work. The book is well prepared and gives a large amount of information concerning stations, shops, ice houses, water stations, etc., not commonly found in a book of this nature. The chapter headings include: Engineering; Land; Grading; Bridges, Trestles and Culverts; Ties; Rails; Other Track Material; Ballast; Maintaining Track and Right of Way; Station and Roadway Buildings; Water Stations; Fuel Stations; Shops and Engine Houses; Icing Stations, and Signals and Interlockers.

ABSTRACT OF ENGINEERING ARTICLES

The following articles of special interest to engineers and maintenance of way men to which readers of this section may wish to refer have appeared in the *Railway Age Gazette* since November 19, 1915:

Transverse Fissures the Result of Rail Gapping. The cold straightening of rails is receiving considerable notice at this time. P. H. Dudley points out the relation between gapping and interior transverse fissures, in an illustrated article in the issue of November 26, page 1001.

The Chicago Association of Commerce Smoke-Abatement Report. After more than four years of study and an expenditure of \$600,000, the Chicago Association of Commerce Committee of Investigation on Smoke Abatement and Electrification of Railway Terminals has presented a 1,200-page report showing electrification to be technically practical but financially impracticable. This report is abstracted in an illustrated article in the issue of December 3, page 1047. An editorial on this report appears in the same issue.

A Large Track Depression Project at Minneapolis. The Chicago, Milwaukee & St. Paul has just completed the fourth year's work on the depression of tracks for a distance of three miles in the city of Minneapolis, which will eliminate 37 grade crossings. This work is described by C. N. Bainbridge in an illustrated article in the issue of December 3, page 1059.

The Elimination of Grade Crossings in Dallas, Tex. A report by John F. Wallace on the situation in that city favors a belt line as a better solution than track elevation. This report is abstracted in an illustrated article in the issue of December 10, page 1087. An editorial note on this report appears in the same issue.

The Electrification of the Railways of Chicago. The report on this subject referred to previously is a very exhaustive treatment. The technical features as presented in this report are abstracted in some detail in the issue of December 10, page 1089. An editorial on the subject appears in the same issue.

Protecting the Right of Way From Encroachments

A Study of the Legal Protection of a Railroad and Practical Means for Retaining Title to Its Property

By W. F. RENCH

Supervisor, Pennsylvania Railroad, Perryville, Md.

Literally defined, the right of way is that by virtue of which the railroad holds its permanent way. It is usually land owned in fee simple or obtained by condemnation, but may include an easement over another's land or the right to cross or occupy the streets of a municipality or the privilege from the federal government of bridging a navigable river. Land which is not used for railroad purposes or that which is vacant and not intended for such use is not right of way and is usually in charge of the real estate department and only of incidental concern to the maintenance officer. The supervisor is the natural custodian of the right of way; the foremen are his lieutenants and the patrolmen the roundsmen. It is quite essential that all of these should know the extent of the company's ground and the rights that are otherwise enjoyed. It is further necessary that the supervisor should definitely understand the legal principles of property tenure, in order to be able to meet promptly and decisively such questions as they arise. Not infrequently while a legal question is being determined occupation is becoming established and is growing increasingly difficult to resist. It is an old adage that possession is nine points of the law and it is a legal axiom that he who would sue to dispossess another must first show a better title. The surveyor fully understands that in tracing property corners he must if possible make a location in accord with the record and yet not in conflict with possession. The importance of resisting a trespass is thus self-evident.

It is a rule of law that an individual may obtain title to land by adverse possession for a term of years, but that a corporation cannot thus gain an ownership, although a continuing easement for the use of a right of way may be so acquired. It is not correct, as is generally supposed, that lines do not under any circumstances become fixed by acquiescence in a less period than 20 years. Road lines may by statute become conclusively fixed in 10 years and there is no particular time for concluding ownership between private parties who tacitly agree to a particular line of division.

Property rights are so simple that they may nearly always be determined by the rule of common sense. There are, however, certain distinctions which can only be determined by a working knowledge of the principles of legal technology. Thus, the error is quite plain of permitting the public to gain by adverse use a right of passage over the company's land for either foot or vehicle travel, but when these ways are the approaches to public facilities of the railroads such use is not adverse and no permanent easement would result. It is very necessary to understand fully the legal meaning of the term adverse user or adverse possession. In the case of traveled ways an acquiescence without objection in the public use would indicate an intention to dedicate, and as regards possession of ground the use must be adverse to the interest of another and it must be continued in the manner prescribed by the statute as well as for the required time.

The boundaries of the right of way are usually parallel with the center line, which is then known as the center line of right of way. Although this line originally bore a direct relation to the tracks it does not, as some suppose, shift with them. Since the descriptions in the deeds are referred to it, its position is fixed and it should be permanently located by means of monuments and by reference data. In these cases where the property limit is a stream, with the single exception of navigable rivers, ownership extends to the middle of the stream, no matter what changes in its course the stream may undergo. In the case excepted, the federal government owns the bed of the stream between low water lines and the direct control is vested in the

secretary of war. The railroad as owner along an inland river can resist an attempt of a proprietor below to raise and thus set back the water lines and, in fact, possesses all the natural rights that are common to riparian owners. The matter of conserving the natural means of discharge for storm drainage is scarcely less important than the protection of title; every water course should be shown on right of way maps, to be used as evidence in case an attempt is made to close such an outlet.

When a street forms the boundary of a property, ownership ends at the house line, but certain rights in the sidewalk attach to the abutting owner, and for this reason repairs of the sidewalk are generally the duty of the owner. When a public street or road is vacated the abutting owners take by law to the middle of the abandoned highway. If local acts do not impose upon the railroad the entire burden of maintaining fences, the law requires that the expense be equally shared, but participation cannot be demanded until the owner has a bona fide need for the enclosure.

When trees or artificial objects close beside the right of way endanger the company's operation, request may be made for their removal, and in case of refusal damages could be claimed, if such result, provided the cause of the injury is not an unusual and unforeseen circumstance. The principle is the fundamental one that an owner must so use his property as not to injure his neighbor. When branches of trees overhang and threaten interference with the telegraph line the railroad has the right to trim them, but it is always best to obtain the owner's permission in writing, since in the event of damage to the tree the courts are inclined to make a liberal allowance for sentimental value.

MARKING RIGHT OF WAY LIMITS

The importance of having the limits of the right of way visibly defined is becoming better appreciated, and upon several divisions of the Pennsylvania this work is already completed and it is expected that it will be finished upon others within the present year. The plan adopted where no buildings or fences indicated the lines was to plant wooden posts at corners and 400 ft. apart on tangents and 200 ft. apart on curves. The posts are 5 in. square, 4 ft. 6 in. long and protrude 2 ft. above the ground, this portion being painted white. The posts were set after a careful survey by a party from the division engineer's office. It is the practice of many divisions to thus establish all property lines, and this is certainly safer than a location by the supervisor, since property records are seldom entirely correct outside the division offices. While it is important that the supervisor know the exact extent of the company's holding, there is always the possibility that new conveyances may not be promptly certified to him. The law in cities usually requires that street lines shall be defined by the city surveyor and it is customary for this official also to establish lot lines when so desired. Such a survey is both reliable and authoritative.

The marking of the right of way is not of maximum use unless care is taken to correct the lines for subsequent property acquisition or surrender. It is the practice on some roads to plant monuments at the corners of new conveyances. This is based on a sound principle since the existence of a monument is evidence of the original survey whether or not it is called for by the recorded plat. These marks should still be supplemented with the attention-compelling white painted post.

BENEFITS FROM THE RE-SURVEY

As a result of defining the right of way lines on the Pennsylvania a surprising number of small irregularities and several that were of greater consequence were found. Many gateways

were noted opening upon the right of way; paths were located crossing the railroad, and just as frequently extending longitudinally, a more difficult trespass to resist; and the edges of the company's land were here and there going under the plow. At one point the fence along a homestead was several feet within the line and occupation could be proven for nearly the required time. The saving of this ground allowed the cut to be widened to the standard section. Just opposite, where land is needed for this purpose, the owner names a price of \$2,000 per acre for farm land in a country district. Encroachment by permanent structures was not encountered, as there almost always is proper diligence in this respect.

Vigorous efforts were made to discontinue the intrusion through the gateways and where this could not be done agreements were insisted upon. The driveways were effectively blocked by heavy posts and signs forbidding trespass erected at the paths. Where title to the land being farmed was through purchase, leases were obtained, thus establishing the company's ownership, when ultimate recovery of possession was rendered easy. Care was taken that no land obtained by condemnation was leased, as, except for purposes incident to the company's operation, such leasing is unlawful. Where unrecorded wire crossings or other similar facilities were found they were quickly brought under agreement.

The advantages in having the lines defined are thus manifold and the disadvantages are few. In addition to the main object of preventing encroachment there are economic benefits which are quite measurable. In rugged country where the right of way is usually unfenced, the mowing and cutting of brush whose main object at such points is the maintenance of a clean right of way as a defense against fire claims is usually done over a wider swath than necessary because the property limits are not known and this increase of roadway expense accrues year after year. The performing of work outside the property limits is not only wasteful, but such action sometimes leads to embarrassing complications. The fact of work having been done upon a private roadway by company forces, even though done by misconception, would in the event of an accident operate to deprive the railroad of a non-suit.

The expense incident to a property survey is, of course, widely different for dissimilar situations. But there can be no doubt that the advantages derived exceed the cost many times over. Then there is the fact of stewardship, which alone would justify the means taken to guard the company's holding even if not one irregularity were uncovered.

THE EFFECT OF ENCROACHMENTS

The great difficulty that is experienced in dislodging squatters should emphasize the importance of preventing encroachments and, if they should occur, of removing them as expeditiously as possible. The consequence of an occupation permitted to continue until title is endangered or perhaps lost is sometimes quite far-reaching. The case of an important grade separation project being held up for two years during which the million dollar investment was inactive is a striking illustration in point. Cases are not uncommon wherein the railroads have had to buy back for important work land that the right of way sheets indicated as already owned. There have, indeed, been cases where it was impossible, by reason of the lost property having become part of a homestead, to repossess at any price. Important improvements are thus prevented by lack of attention on the part of those who should protect the company's possession.

There is the other item of encroachment by the railroad upon the property of adjoining owners. Such encroachment is undesirable from all standpoints, and the moment it appears should be effectually remedied. The old saying of a stitch in time is aptly illustrated in such cases. If the means are afforded promptly to observe the approach of an erosion to the line a simple construction may arrest its progress, but if it is allowed to continue nothing short of money compensation or the purchase of additional width generally at an exorbitant price will settle the claim.

THE PARTY WALL LAW

A party wall is a wall upon the line between the premises of adjoining proprietors which each has a right to use as a support for his structure. It is a form of exercise of police power for the economic use of property, and is mainly applied in cities. While the regulation is of ancient origin it is in most states distinctly defined by statutes. These usually provide that it shall be built equally upon the lands of the adjoining owners, with its maximum width limited by different conditions, and its original expense of construction borne by the proprietor who first uses it, but with half the expense a charge against the adjoining owner when he builds to it.

The application of the law is sometimes misunderstood since not all walls between adjoining properties are included. In fact, the only wall to which it applies is that supporting a building. A wall forming or supporting a fence or one used to retain the ground is not within its purview.

There can be no question of the equity of the statute as between owners presumed to hold for a common object. But it cannot be held to apply against the property of a railroad owned and intended to be used for a right of way for tracks. To thus apply the law with no reciprocal benefit possible to the railroad would plainly amount to confiscation. In the writer's somewhat extensive acquaintance with conditions surrounding a considerable section of the city of Philadelphia only one case is known of occupation of the right of way under the party wall law, and this is recognized as an error. The mistake is a serious one, as the use of present facilities necessitates the operation of one track with a limited clearance. A knowledge of this point may serve to avoid other disadvantages of similar nature. In those cases wherein the acquirement of property for a right of way necessarily involves the continuation of an existing party wall it is well to know that the adjoining owner could be enjoined from making use of it for displaying a sign of any kind, even one painted thereon.

LATERAL SUPPORT

The common law requires that an owner shall be protected in the use of property at the contour that nature has provided, or that which it held at the time of his purchase. An adjoining owner is thus prohibited from raising or lowering the level of his ground without supplying adequate support for his own or the adjacent land, and this support must be provided without any sacrifice whatever by the neighbor. No act of a municipality can abridge or change this duty. Such a circumstance in railroad practice most commonly occurs when an adjoining owner lowers the contour of his yard to obtain increased storage capacity. For whatever depth there is below the natural level of the ground he could be compelled to provide a sufficient retaining wall entirely upon his own ground.

The obligation between a municipality and the railroad company is not so clearly defined, and such cases are usually disposed of by a mutual agreement. It may safely be stated that in the absence of such understanding the railroad company must be afforded the advantage of its day in court.

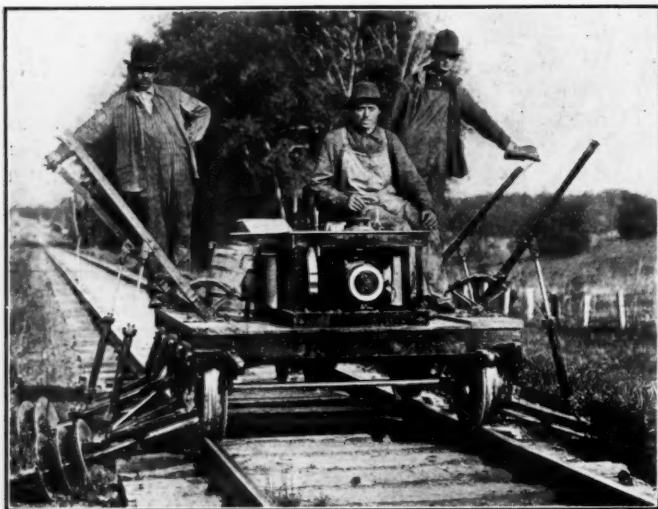
THE DAY IN COURT

When it is necessary for the municipality to take property for public use a day is appointed for a hearing before the jury of view or the commission, as such bodies are now more generally constituted. At this hearing both the damages and benefits are assessed. If an owner suffering damage fails to appear he is prevented ever after from bringing forward his claim and must also accept his assessment for benefits. It therefore becomes a matter of great consequence to the railroad not only to have its representatives present, but to delegate this duty to those who are familiar with all the various questions involved. Counsel is most essential, but the real estate expert is an important participant, and the supervisor, who, by reason of his intimate detailed knowledge of the local situation, is generally selected as the engineer, will have a responsible function in the proceeding.

MOTOR CARS FOR WEEDING AND MOWING

The Fairmont Gas Engine & Railway Motor Car Company, Fairmont, Minn., has developed special motor car attachments during the past season for mowing and weeding on railroads.

The mowing machine consists of a motor car equipped with mowing knives on each side capable of cutting a 6-ft. swath outside of the ballast line on each side of the track. It is operated by three men, one to run the car and two to handle the knives, which may be raised and lowered readily to conform to the contour of the banks to avoid obstructions. The machine is geared to run about three miles an hour when operating the



The Weeding Car at Work

mowers and 15 miles an hour on the high gear with the cutter bars raised.

The weeding car is equipped with four sets of disc plows of three discs each, attached to the four corners of the car. The machine is also operated by three men, but the absence of power connections make it somewhat simpler. The position of each set of discs is controlled by a lever to which it is attached by a rod working in a 2½-in. tube 2 ft. long. This contains a compression spring to maintain a "give and take" pressure between



The Mower Car With Knives in the Cutting Position

the lever and the disc shaft. If the discs strike a stone the spring allows them to raise and then pushes them back again.

A fender keeps gravel from being piled too high at the ends of the ties and three drag chains smooth down the disc furrows and pull out the uprooted weeds. With the discs working, this car operates at three miles an hour, but when they are raised, the car is capable of making 20 miles an hour on the high gear. By removing the disc arms and levers the car is available for ordinary motor car service.

Both of these machines have been in use on the Chicago, Milwaukee & St. Paul during the past season. A mower made two cuttings over a division 150 miles long at a total cost of \$170 for labor and fuel, or \$0.57 per mile of cutting. Three cuttings were made over the same division with the discer at a cost of \$196 for labor and fuel, or \$0.44 per mile of cutting.



The Mower Car With Knives Raised

The results obtained with these machines are said to be as good, if not better, than those obtained by hand work. The discing machine cleans out the weeds thoroughly and gives a straight, uniform grass line. The mower cuts weeds and heavy stalk vegetation as well as grass.

BRIDGE AND BUILDING ASSOCIATION COMMITTEE APPOINTMENTS

The following subjects have been selected for committee work for the American Railway Bridge & Building Association for the ensuing year, and the president has appointed members on these committees as indicated:

Water Supply. (A) Intakes and Intake Lines; (B) Internal Combustion Engines. Chairman, C. R. Knowles, I. C.; C. A. Lichty, C. & N. W.; James Dupree, C. T. H. & S. E., and J. J. Murphy, S. P.

Floors for Shops, Etc. Chairman, D. Rounseville, C. & N. W.; J. S. Robinson, C. & N. W.; G. A. Mitchell, G. T.; R. M. Bowman, L. E. & W., and G. E. Boyd, D. L. & W.

Paint and Its Application to Railway Structures. Chairman, C. E. Smith, Mo. Pac.; F. E. Schall, L. V.; J. E. Greiner, B. & O.; H. B. Stuart, G. T., and C. Ettinger, I. C.

Caring for and Handling Creosoted Material. Chairman, E. T. Howson, *Railway Age Gazette*; F. D. Mattos, S. P.; D. A. Shope, A. T. & S. F., and J. S. Lemond, Southern.

Blank Forms for Bridge and Building Department Use. Chairman, R. C. Sattley, C., R. I. & P.; G. W. Hand, C. & N. W.; B. F. Ferris, S. P., and G. A. Rodman, N. Y., N. H. & H.

Modern Method of Driving Piles. Chairman, Maro Johnson, I. C.; J. P. Canty, B. & M.; R. H. Reid, N. Y. C.; J. P. Wood, P. M., and O. F. Dalstrom, C. & N. W.

Fireproofing Roofs of Wooden Buildings. Chairman, J. N. Penwell, L. E. & W.; Niles Searls, S. P.; E. C. Morrison, S. P., J. W. Miller, C. & N. W., and F. O. Draper, I. C.

Efficient Methods of Handling Work and Men. Chairman, F. E. Weise, C., M. & St. P.; E. R. Wenner, L. V.; S. C. Tanner, B. & O., and J. F. Pinson, C., M. & St. P.

Station Buildings for Passenger Service Only. Chairman, M. A. Long, B. & O.; E. B. Ashby, L. V.; G. W. Andrews, B. & O., and J. B. Gaut, G. T.

Economical Handling of Concrete on Smaller Jobs. Chairman, L. D. Hadwen, C., M. & St. P.; J. W. Wood, A. T. & S. F.; C. F. Green, S. P., and G. H. Stewart, B. R. & P.

Small Coaling Stations. Chairman, Lee Jutton, C. & N. W.; W. F. Strouse, B. & O.; J. H. Nuelle, N. Y. O. & W., and G. W. Kinney, D. & R. G.

OIL FUEL IN INDIA.—Tests to determine the economy of oil as fuel for railway service have now been going on in India for over a year, with results so favorable that the question of substituting oil for coal is merely a question of comparative prices.

Creosoted Wood Block Floors for Railroad Buildings

Precautions Which Are Being Observed and Results Which Have Been Secured With This Modern Material

The successful use of treated wood block street pavement dates back to 1874, when 75,000 sq. yd. of creosoted long leaf pine blocks was laid in Galveston, Tex. These blocks remained in use 29 years. Since that time this type of pavement has come to be widely used throughout the country, particularly in dense traffic business sections of large cities where the paving requirements are the most exacting. In recent years this material has also been given extensive use for the floors of buildings devoted to a variety of industrial purposes. The wide range of its usefulness in buildings is indicated by its use in machine shops, foundries, print shops, fire stations, bakeries, stables, hotels and hospitals. On railroads they have given favorable

or the proper manner of laying wood block pavement had been developed. Under traffic the fibre ends of the timber flatten out, forming a compact wear-resisting cushion which tends to close up the joints between adjacent blocks and also effectively protects the body of the blocks. The many advantages of this pavement arise from the peculiar texture of the surface, which while it is sufficiently hard to class high among high-grade pavements from the standpoint of small rolling resistance, possesses a resilience which makes it particularly valuable for industrial use. It is quiet, and it does not tire the feet like the hard surfaces of concrete or steel plates. Brittle objects dropped on it are not so easily broken as on the harder floors, nor is the



Wood Block Floor in South Chicago Freight House of Pennsylvania Lines, Laid in 1912

results in freight stations, shop buildings and roundhouses, the Chicago & North Western having used them in 19 separate buildings, aggregating in excess of 31,000 sq. yds. of floor.

The use of properly treated and laid creosoted block floors in railroad buildings has extended over a period of only five or six years, by far too short a period to demonstrate even approximately the total useful life to be expected of them. While unfortunately, a number of the oldest installations are so inferior as to material and manner of laying that they do not represent good work according to the present standards and have long since been discredited, all of the floors laid according to proper specifications are giving excellent service.

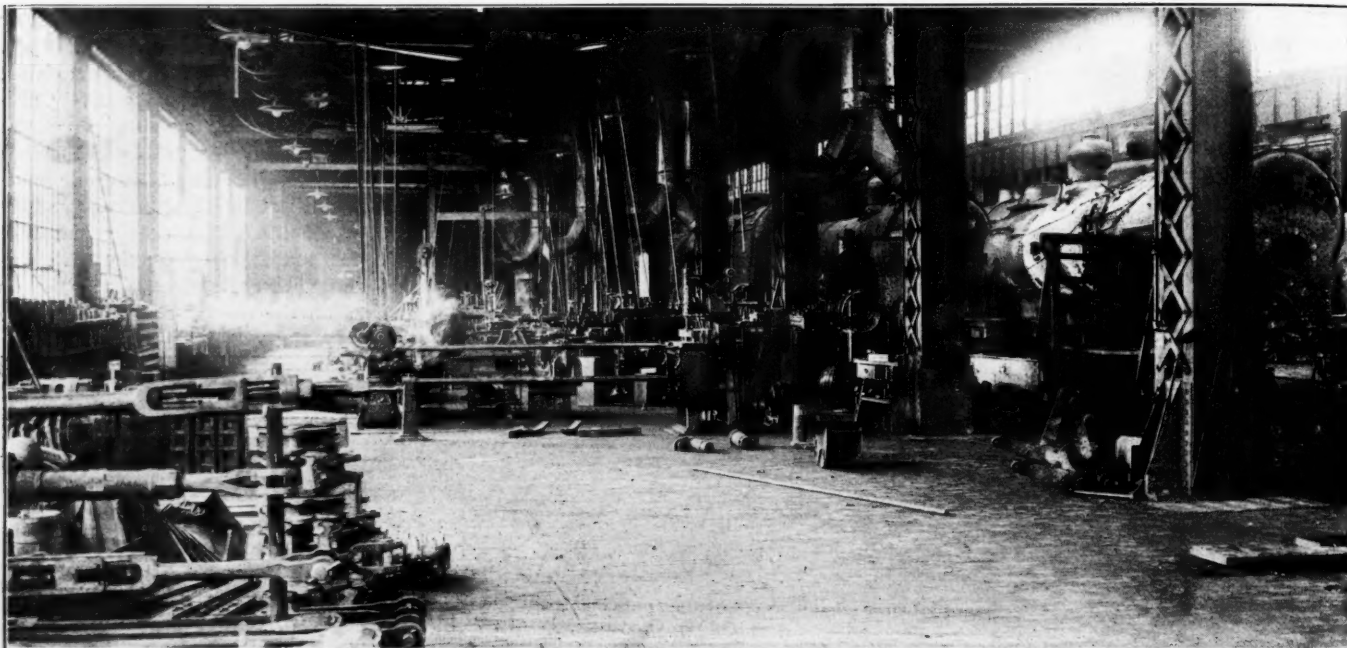
The resistance which even a soft wood offers to compressive or abrasive agencies on the ends of the fibres was recognized long before methods of wood preservation had been discovered

floor subject to chipping or cracking from the dropping of heavy objects on it. Two other advantages from a physiological standpoint result from its insulating quality which makes it warm to the feet in cold weather and the fact that it is a poor reflector of light, thus doing away with the glare experienced with many classes of floor.

The cost of the block floor as built for interior use with blocks not over three inches thick and a stone concrete base ranges from \$1.75 to \$2.50 per sq. yd. in place. Floors with a 4-in. cinder concrete base have been laid for \$1.65. These figures are based on installations under average conditions. Very small installations with unfavorable conditions would cost more. Wood block floors have been built on sand and gravel foundations at prices somewhat lower, but in general the omission of the concrete base is to be recommended only in cases where

the floor is subject to foot traffic alone. Attempts to reduce the cost by resorting to inferior methods and materials have usually resulted in dismal failures. The service exacted of floors used for diverse industrial purposes is subject to such variations that there is as much if not more need of expert super-

other hand, blocks supported on a concrete or earth foundation are exposed only to the upper face, which has been found to be highly fire-resistant. This was demonstrated in the Baltimore fire, where a section of experimental wood block pavement withstood the conflagration with an inconsiderable



Block Floor in Locomotive Erecting Shop of Michigan Central at Jackson, Mich.

vision than in the case of the street pavement. Difficulty has been experienced at different times with swelling from the absorption of water on one hand and from the presence of oil or pitch on the surface of the block on the other hand, conditions which could have been avoided, without question, if the blocks had been prepared and placed under the direction of an expert

charring on the surface, while the adjacent sections of brick and granite block pavements were spalled and cracked by the heat. A severe fire test of wood block pavement took place in the burning of the Philadelphia & Reading pier No. 36 at South Wharves, in October, 1914, which is reported as follows: "This fire was so hot that a large portion of the structural steel was



Severe Service on a Floor in the Allegheny Shops of the Pennsylvania Lines

having adequate knowledge of the service to which the floor would be subjected.

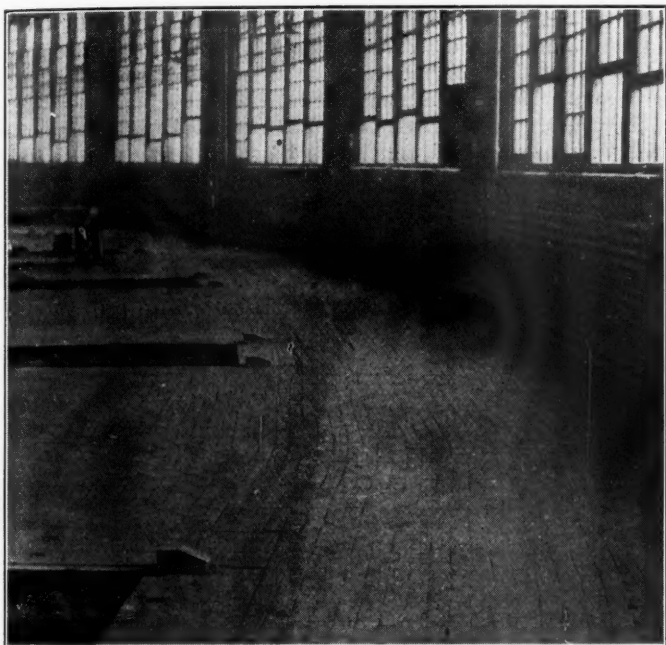
A number of disastrous fires in the creosoted wood block floors of bridges, which have received considerable publicity during the past year, have caused no little apprehension in the minds of many as to the fire hazard of creosoted floors in buildings. While creosoted lumber is highly inflammable once it becomes ignited, ignition does not take place as readily as in untreated lumber. Investigation has shown that in all the bridge floor fires reported the creosoted blocks were supported on wooden planking, a condition highly favorable to fires. On the

fused, the whole pier shed was destroyed and the greater portion of the burnt wreckage was thrown down on the wood block floor. After the removal of the debris, it was found that the wood blocks, which had been subjected directly to the flames were only charred $\frac{1}{8}$ to $\frac{1}{4}$ in. deep, but where the fused structural steel had come into contact with the wood blocks, they were charred from $\frac{3}{4}$ in. to 1 in. deep.

WOODS USED

A number of varieties of woods have been used in block floors. The report of the Committee on Wood Block Paving of

the American Wood Preservers' Association for 1915 records the use of long leaf and short leaf pine, yellow pine, black gum, tamarack, Washington cedar, Norway pine and red fir. Tests made by the city of Minneapolis included Norway pine, tamarack, birch, larch, Douglas fir, long leaf pine and eastern hemlock. The use of hard maple has also been reported in one or two instances. The principal requirement in a wood is resistance to wear, compressive strength of fibres endwise and susceptibility to impregnation by preservatives. Hard woods such as maple, which are peculiarly adapted to use in flooring



Installation of Wood Blocks in Lackawanna Roundhouse at Elmira, N. Y.

because of resistance to wear and compression perpendicular to the grain, seem to possess no advantage over the softer woods when subjected to conditions of end grain wear obtaining in a block floor.

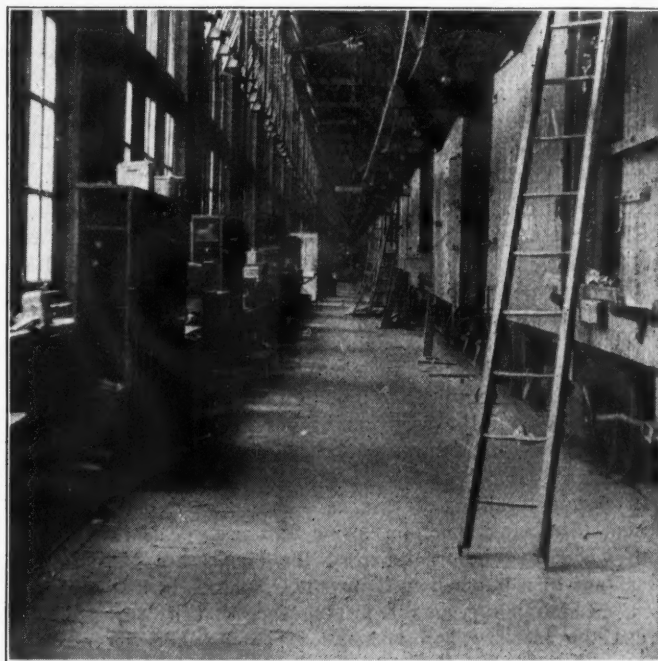
Southern pine, particularly long leaf, enjoys the most extensive use for this purpose. Specifications for the use of southern yellow pine usually provide definite limits as to the amount of sap wood and frequently specify definitely the use of long leaf pine only. From the following quotation from a report on wood paving in the United States by C. L. Hill, assistant forester, United States Department of Agriculture, it would seem that these restrictions are not warranted. "The true long leaf pine has usually so narrow a sap wood that it could be neglected without danger to the life of the pavement. In loblolly, the sap wood is often very wide, but loblolly pine is one of the species for which it has been proved that sap wood under equal conditions of moisture contents is as strong as heart wood. Therefore, when effective seasoning of paving material can be assured before the creosote treatment, the prohibition of sap wood in Southern pine material is needless and should be omitted from specifications." It would seem that a specification establishing the density of the timber along the lines recently adopted by the Southern Pine Manufacturers' Association by limitation of the minimum number of rings per inch would be all that is necessary. Soundness is of prime importance and blocks must be inspected rigidly to detect knot holes, decay, bark, large or loose knots, shakes and checks. The blocks must also be truly rectangular and free from irregularity in sawing.

Many sizes of block have been used. As a rule commercial blocks are from 3 to 4 in. wide and from 4 to 10 in. long. A single thickness for a given piece of work is, of course, essential, but uniformity in the length of the blocks is not necessary, though occasionally specifications provide for a definite

length as well as width. In a number of cases railroads have been making their own blocks by sawing up the ends of waste lumber, and, under those circumstances, almost any size of timber has been used. In depth, blocks vary from $2\frac{1}{4}$ in. to 6 in., but for ordinary interior use there seems to be little call for a thickness greater than 3 in. There are on the market blocks $2\frac{1}{4}$ in. thick for use under light service. Aside from the service to which the blocks are subjected, the depth of blocks is governed by the ratio between depth and greatest dimension across the grain. Owing to the characteristic weakness of timber in shear and tension in planes parallel to the grain, there is danger of a high percentage of broken blocks whenever the length of the block exceeds three times the depth. For this reason a reduction in the thickness should be accompanied by a limitation of the length. Most specifications permit the variation of $1/16$ in. in the depth and thickness of the blocks. Manufacturer's specifications sometimes call for a tolerance of $1/8$ in. in the thickness. A small variation in the depth is readily adjusted in the cushion bedding, but variation in the width affects the width of the joints and the regularity of the laying.

TREATMENT

The subject of timber treatment is too broad for more than a brief discussion here. It suffices to say that creosoting under pressure is the only preservative process seriously considered at this time for the treatment of blocks. Some railroads have reported favorably on the use of dipped blocks, but their use has covered so short a time that it does not constitute a real test. The treatment of blocks for interior use is a matter of



Creosoted Block Floor in Lackawanna Car Repair Shops at East Buffalo

greater complexity than is the case with blocks in street pavement, because of the diversity of service to which the former are subjected and while the methods of treating the blocks for street pavement have been widely discussed, little publicity has been given to the detailed method of treating blocks for interior use.

Block pavement on open freight house platforms is subjected to much the same condition as in street pavement. This is true to a certain extent also of floors in roundhouses and in certain classes of shops where much water is frequently spilled, particularly around hydrants. In such cases security against swelling is an important consideration. In warehouses, on the other hand, the blocks have a tendency to shrink. In general, bleeding of creosote and pitch is much more objectionable in

building floors than on streets. This is true particularly of freight house floors, where, for instance, flour may be stored. In general blocks for interior use receive a lighter treatment, hence, open-cell processes rather than full-cell processes of treatment are the rule and the admixture of coal tar or other ingredients than creosote oil must be done with the exercise of much greater care than is necessary with street pavement blocks.

FOUNDATION AND CONSTRUCTION

To be a success, any pavement must have an unyielding foundation. A concrete base is almost universal with the creosoted block pavement, though there have been cases where the blocks have been used successfully on a well-packed sand and gravel bed. Similarly, instances may be cited where certain cities have built brick pavements which have stood years of traffic with no other foundation than the natural sandy soil, but these are exceptional cases where the soil conditions were ideal and it cannot be considered good practice in connection with either brick or creosoted block pavements. This is particularly true in building work, where the ground surface usually has been disturbed for the purpose of installing pipes, drains, etc., just previous to the placing of the floors. For floors subjected to loads not exceeding 1,500-lb. concentrations, cinder concrete foundations may be used with safety and economy.

Practice in placing a concrete foundation needs little comment here, as it is governed by the principles covering the use and production of good quality of concrete. For ordinary interior use the base need not exceed 3 to 5 in. in thickness. Precaution should be taken to insure a well-compacted foundation bed with special attention to places where the ground has been disturbed recently. In addition, care should be exercised to secure a level and reasonably smooth surface at the desired grade.

In European practice, the surface of the concrete foundation is finished with such exactness that the blocks may be and generally are laid directly on the concrete. While this practice has never prevailed in this country for street pavements, it is used for interior floors in connection with the use of a thin bitumen cushion. In other cases a sand cushion $\frac{1}{2}$ in. to 1 in. in thickness is used between the base and the blocks. The primary object of the cushion is to provide a smooth surface which is sufficiently soft to allow adjustment for slight variations in the depth of the blocks. Incidentally, the layer of sand is said to serve as a resilient bed for the blocks, with a resulting decrease in surface wear. Its disadvantage lies in its tendency to shift under condition of saturation, heavy gradients and heavy load on restricted areas.

In certain localities the use of a dry mortar, usually 1 part cement to 4 parts sand, has come into use. This is sprinkled with water just before or after the blocks are placed. The advantage of a bitumen cushion is not so much in its superiority as a cushion but results from the fact that it works up between the blocks when pressure is applied and serves as a filler. The usual method is to apply one coat of pitch to the concrete and squeegee to give it a smooth surface. A second coat is applied just before the blocks are placed, so as to be soft when the blocks are laid down.

Expansion joints ordinarily are required only along the walls of a building and around machine foundations or other obstructions which project through the pavement. The following specification represents good practice: "Expansion joints shall be formed by placing a 1 in. by 4 in. board on edge against the sides of the building and around foundations. After the blocks are laid, and after tamping or rolling, the strips shall be removed and the voids filled with a low-melting-point pitch to within $\frac{1}{4}$ in. of the wearing surface of the floor."

Because of the difficulties encountered with the swelling and contraction of the blocks under different circumstances the filler is an important item in a successful pavement. Three materials commonly used for this purpose are sand, cement grout and pitch. The latter is the most commonly used and is

giving the best satisfaction. The following quotation from the proceedings of the American Wood Preservers' Association for 1915 expresses the views for and against the bituminous filler: "Those favoring the bituminous filler argue that the joints filled with a tar or asphaltic preparation constitute individual expansion joints between each block, thereby allowing for expansion throughout the pavement. Moreover, it is claimed that the pavement is made waterproof and that no moisture can enter between or under the blocks. On the other hand, advocates of the other fillers argue that a bituminous material becomes soft and sticky from the oils that exude from the blocks and may add to the bleeding trouble." Sand filler is said to have a tendency to work down under the blocks and thus leave the joints open. The pitch filler is usually applied by pouring it between the blocks at a temperature sufficiently high to make it thoroughly fluid. After the joints are filled, squeegees are used to force pitch into the cracks and scrape away the surplus from the surface of the blocks. The latter object is also accomplished readily by an application of hot sand. In cases where a bitumen cushion is used under the blocks all that is necessary is to tamp or roll the blocks thoroughly, which will press the cushion up and completely fill the joints from below.

Practice as to a sand dressing does not differ from ordinary outdoor pavement work.

EXPERIENCE WITH WOOD BLOCKS

Railroads have used creosoted block floors extensively in erecting and machine shops, boiler shops, and in some cases in wood-working shops. Among installations for this purpose have been those of the Pennsylvania Lines at Allegheny and Conway, Pa., the Baltimore & Ohio at Mt. Clare, Md., the Illinois Central at Memphis, Tenn., the Chicago, Milwaukee & St. Paul at South Minneapolis, Minn., the Michigan Central at St. Thomas, Ont., the Central of Georgia at Macon, Ga., the Lackawanna at Scranton, Pa., and East Buffalo, and the Northern Pacific at Brainerd, Minn.

The Central of Georgia has an extensive installation of creosoted wood blocks in its engine terminal buildings at Macon, which has been in service for 5 and 6 years. The machine shop and boiler shop together contain 12,140 sq. yd. of 3-in. blocks laid on a concrete base 5 in. deep with a $\frac{1}{2}$ -in. sand cushion. All of the blocks are 3 in. by 8 in. and the joints are filled with a sand and cement grout. This floor cost \$2.70 per sq. yd. complete in place. The round house contains 5,000 sq. yd. of 4 in. blocks laid on a concrete base $4\frac{1}{2}$ in. thick with a $\frac{1}{2}$ -in. sand cushion. The cost of this floor in place was \$3.05. All of the blocks are long leaf yellow pine treated with 18 lb. of creosote oil per cu. ft. No expansion joints have been provided and no trouble has been experienced with swelling. The blocks in the round house were laid in 1909 and those in the other buildings in 1910, and have been subjected to hard usage, particularly from falling castings. They show little wear, no sign of decay and the surface is excellent.

The Michigan Central placed a block floor in its general locomotive repair shops at St. Thomas, in 1913, using creosoted hard pine blocks 3 in. by 8 in. by 14 in. They were laid on a concrete foundation with a 1-in. sand cushion and expansion joints 1 in. wide, spaced 50 ft. apart and filled with asphalt. The floor is subject to heavy usage from the dropping of heavy castings, etc., but has thus far shown little wear. Some trouble was experienced with swelling of the blocks in places where they became wet.

The Northern Pacific has several installations of blocks made of the waste ends of Douglas fir lumber in the shops at Brainerd, comprising about 2,164 sq. yd. These are cut 4 in. long, but are not sized up to any particular dimension, leaving the blocks as they come from the timber, to save as much labor as possible. After accumulating about a car load of blocks they are sent to the tie-treating plant for and given about a 12-lb. treatment. They are laid on a concrete base from 3 to 4 in. thick with a 1-in. sand cushion. The first installation of these floors was made in 1911, no repairs have been made up to the present time and the floors are said to be in perfect condition. The area

of this type of floor is being extended as fast as the material is available.

The Lackawanna has used the blocks in a machine shop at Scranton, Pa., since 1912, a car repair shop at East Buffalo and in a roundhouse at Elmira, N. Y., containing 30 stalls. In 10 stalls the blocks were laid with a cement grout filler and in the other 20 with a coal tar filler, the latter giving the best results.

The Oregon-Washington Railroad and Navigation Company installed a creosoted block floor in a new 10-stall roundhouse in 1912 that is giving very good service.

In the Mt. Clare boiler shops of the Baltimore & Ohio, 4,700 sq. yd. of 3-in. by 4-in. by 8-in. blocks were used on a 6-in. bed of concrete, which is holding out better than any type of floor previously used. This floor has been in service about two years. A machine shop at that place contains 1,940 sq. yd. of the same type of construction. This road has also used wood block floors in freight houses, the largest installations being at the terminal freight house at Cincinnati and the inbound freight house at Washington, D. C., which have been in service for four years. The Washington installation covers an area of 50 ft. by 300 ft., on a sand bed, and while not giving as good service as blocks placed on concrete, it has given better service than the ordinary type of flooring. The blocks used on earlier installations on this road were treated with 16 lb. of creosote per cu. ft., but it was found that the oil came out of the blocks and damaged freight, especially flour. In subsequent installations the treatment has been reduced to 10 lb. and the results are very satisfactory.

There is an installation of wood block floors in the Allegheny shops of the Pennsylvania Lines, placed on a 6-in. concrete base with a sand cushion of the unusual thickness of 2 in., the joints being filled with pitch. This floor has been in use for seven years and is in good condition. Around boring machines where pieces of metal are frequently dropped, some repairs have been found necessary. At the Conway shops, wood block floors were laid with a 4-in. concrete base and a 1/2-in. layer of fresh cement, the joints being filled with pitch. This floor has been in use since 1913, and is in excellent condition. Blocks are also used in the South Chicago and Erie freight houses, the former laid in 1912 and the latter in 1914. Both floors are giving entire satisfaction. On the South Chicago floor, some trouble was experienced at first on account of excessive pitch, but this has since been remedied. The floor in the Erie house was laid on a 6-in. concrete base with a 1-in. sand cushion. Expansion joints were provided around the walls one inch wide, filled with pitch. The floor cost \$2.53 per sq. yd. in place.

An installation previously mentioned is that of the Philadelphia & Reading in ferry houses and wharves at Philadelphia. In the Chestnut street ferry house the blocks were laid on a creosoted plank floor embedded in cement mortar and thoroughly grouted with sand and cement. The paving has been in service for three years and stands up well under traffic. At freight pier No. 8, South Wharves, the driveways are paved with wood blocks cut from old car sills which were treated with Carbo-lineum and dead oil of coal tar by the open tank process. At piers 34 and 36, South Wharves, the blocks are laid on a concrete base. These blocks are creosoted and the experience with the blocks on pier 36 when that pier was destroyed by fire has been described previously.

COMMITTEES OF THE ROADMASTERS' ASSOCIATION

The following committees and subjects have been selected by the Roadmasters' and Maintenance of Way Association for the ensuing year:

Recommended Practice Regarding the Anchoring of Track, the Uniform Spacing of Ties and the Elimination of the Slot Spiking of the Joints: P. M. Dinan, L. V., chairman; P. H. Madden, C. M. & St. P.; L. C. Ryan, C. & N. W.; G. H. Prentice, L. S. & M. S.; G. A. DeMore, N. Y., N. H. & H.;

J. G. Hutchinson, C., R. I. & P.; W. E. Davin, P. & L. E.; A. E. Hansen, A., T. & S. F.; M. J. Connerton, C. N. O. & T. P., and L. Coffell, C. & E. I.

Seasonable Distribution of Maintenance Work and Forces: M. P. Condon, N. Y., N. H. & H., chairman; J. H. Cummings, B. R. & P.; John Shea, D. & I. R.; J. B. Oatman, B. R. & P.; J. Dougherty, St. L. & S. F.; D. McCooe, G. T.; F. H. Hansen, C. & A.; N. McNabb, M. C., and J. B. Kilby, M., St. P. & S. M.

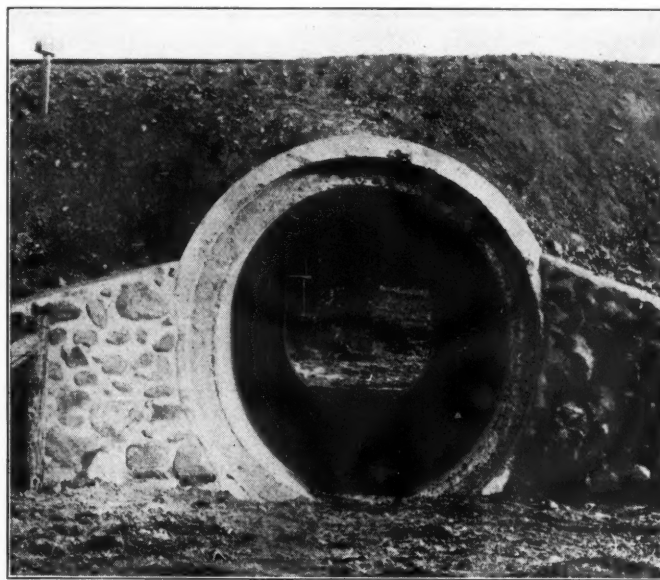
Equating Track Values: A. Grills, G. T., chairman; P. J. McAndrews, C. & N. W., vice-chairman; W. Shea, C. M. & St. P.; C. J. Coon, N. Y. C.; A. J. Neafie, D., L. & W.; A. E. Hansen, A. T. & S. F.; D. McNabb, M. C.; C. E. Erwin, A. C. L.; J. O'Connor, M., St. P. & S. S. M.; M. Donahue, C. & A., and George Beckingham, G. T.

Paper on Standard Report Forms for the Roadmaster's Office, by E. T. Howson, *Railway Age Gazette*.

Paper on Brooms for Snow Service, by T. Thompson, A. T. & S. F.

CONCRETE CULVERT PIPE FOR CATTLE PASSES

In the extensive use of concrete culvert pipe for openings under railway embankments a diameter of 5 ft. has usually been the maximum size used and for this reason these culverts have served almost exclusively for waterways. As a departure from this practice, P. Swenson, bridge engineer of the Minneapolis,



One of the Culvert Cattle Passes

St. Paul & Sault Ste. Marie, has recently conceived the idea of using reinforced concrete pipe of adequate inside dimensions to satisfy the usual contract requirements as a substitute for the usual box or arch culvert for cattle passes. Ten installations of this kind have been made thus far on the line between Minneapolis and Superior, one of which is shown in the accompanying photograph. The opening consists of several sections of culvert pipe 6 ft. 5 in. long with bell and spigot joints. The inside diameter is 7 ft. horizontally and about 7 ft. 5 in. vertically. A flat surface 2 ft. wide at the bottom serves as a walk. The structure is finished off at each end by rubble masonry wing walls; these units were designed and constructed to resist the loads imposed due to the usual dead load and a live load equal to Cooper's E 60 loading. The pipes were installed by company forces at a cost of \$7.50 to \$9.00 per lin. ft., not including manufacturer's price, freight or train service. They were manufactured and furnished by the C. F. Massey Company, Chicago. We are indebted to C. N. Kalk, chief engineer of the Minneapolis, St. Paul & Sault Ste. Marie for the above information.

HINTS FOR THE ORDERING OF LUMBER*

By T. O. Wood

Purchasing Agent, Gulf, Colorado & Santa Fe, Cleburne, Texas

Don't order everything 16 ft. long. Remember almost everyone makes this mistake and orders that length. Consequently about seven-eighths of the orders on mills call for 16-ft. lumber, and all logs are not 16 and 32 ft. long. As a matter of time, your requirements, if made in lengths 12, 14, 16, 18 or 20 ft. long can be filled by a mill in less than half the time required if 16-ft. lengths only are called for. If you cannot possibly use all those lengths, use as many as you can.

Don't order any lengths longer than 20 ft. if two shorter lengths will do; especially try to avoid ordering such expensive lengths as from 28 to 40 ft. if two shorter lengths can possibly be made to answer. Remember that all lengths over 20 ft. cost additional, the present rate of increase on a 20-ft. basis being as follows:

20 ft.	.....\$20
22-24 ft.	.....21
26 ft.	.....22
28 ft.	.....23
30 ft.	.....24
32 ft.	.....25
34 ft.	.....26
36 ft.	.....27
38 ft.	.....29
40 ft.	.....31
Over 40 ft.	.....Special prices

These additional prices do not cover car sills.

Don't order boards and dimension lumber 12 in. wide if less will do; remember the price increases on lumber over 8 in. wide. This can perhaps be shown better by giving an illustration as follows:

100 pc., 1 in. by 12 in. by 16 ft., 1,600 ft., at \$17.....	\$27.20
120 pc., 1 in. by 10 in. by 16 ft., 1,600 ft., at \$14.....	22.40
150 pc., 1 in. by 8 in. by 16 ft., 1,600 ft., at \$13.....	20.80

While getting the same quantity in board measure, the above shows the difference in cost to the company.

Don't order boards and timbers over 12 in. wide if you can avoid it, because the price increases rapidly with the extra width as follows, using the former figures as a basis:

On less than 2 in. thick.	On 2 in. thick and over.
12 in. wide.....\$17	12 in. wide.....\$17
14 in. wide.....20	14 in. wide.....19
16 in. wide.....23	16 in. wide.....21
18 in. wide.....26	18 in. wide.....24

The higher price for timber less than 2 in. thick is owing to the loss in manufacture, from splits, breaks, handling, etc. It would be much better to use two pieces if possible, and you may find it possible in a great many cases.

In ordering surfaced lumber for buildings, if possible order all in rough sizes, or all in finished sizes, the latter being much preferred. Sometimes requisitions show both, and in succeeding lines, and it is very difficult for the person purchasing it to know what to obtain.

Don't forget in all cases of surfaced lumber to state whether S1S, S2S, S1S1E, etc., is desired, as the case may be. Calling for it as dressed, finished or surfaced without stating how this is required, is like calling for boards and giving no size. Where grades are not known by those ordering lumber, the purpose for which the lumber is required should be stated on the requisition. In recent years the cost of surfacing lumber has been reduced somewhat, and to-day the extra cost over rough sizes on 1-in. and 2-in. lumber of standard widths and lengths is 50 cents, and on timbers \$1.00 per M ft. It would help immensely also if those ordering lumber to be furnished by mills in the southwestern territory would remember that the S1S, S2S or 1-in. lumber is 13/16 in. instead of 7/8 in. This latter size is the old northern standard, and is not standard in southern pine.

In ordering lumber for stations, dwelling houses, hotels, etc., don't order the flooring all of one kind. To do this is expensive, and results in having some lumber unnecessarily good and other perhaps not sufficiently good for the purposes required. It will be well to remember that 4-in. flooring runs

on an average \$2 per M less than 6-in., and in my opinion makes a better floor. Never order 6-in. flooring edge grain. It is almost impossible to get it, and if obtained at all, is exceedingly expensive. Also remember edge grain costs \$9 per M more than flat grain of the same grade.

I will venture the suggestion here that for repairs of buildings, houses, etc., good judgment may suggest that something less than the best grade of lumber be used, especially for flooring, on the ground that it is not worth putting in 25 to 50-year lumber as repairs to any building. Also it is well not to use too expensive lumber in a building that may not be in existence in 10 to 20 years' time.

When 1-in. or 2-in. lumber is required, and where wane and sound red heart are not objectionable, by all means order No. 1 Common. No. 1 Common is known at the mills as yard stock, and millions of feet are always on hand, therefore, almost immediate shipment can be obtained. All square edge and sound lumber has to be sawn especially, and no stock is kept on hand at the mills; therefore, it comes much more slowly. No. 2 Common follows the same rules as to thickness as No. 1, but, of course, carries more defects. At the same time it can be used to advantage for many purposes where No. 1 is sometimes ordered, as, for instance, for snow fencing, and it costs from \$1 to \$2 less per M than No. 1, according to the stock on hand at the mills. Of course, there is not as much No. 2 on hand as No. 1.

Just one more little kink about No. 1 Common. You frequently order No. 1 Common S1S up to and including 1 in. by 12 in. Next time you start to do this, don't do it, but order it S2S. You will get more even lumber, just as thick and get it more promptly, and also sometimes at a shade lower price. You will also get more lumber per M ft. than if ordered S1S. A mill prefers to work lumber S2S because that thickness is in accordance with commercial requirements, while S1S is not. Therefore, any degrades will naturally fall into commercial lumber No. 2 grade, without reworking. Be sure and remember that this only covers No. 1 Common up to 1 in. by 12 in.

All stacks should be from two to three feet above ground, to allow free circulation of air, and should be pitched on a slope of one inch per lineal foot, with the front end higher than the rear end; thus in piles of 16-ft. lumber the front end would be 16 in. higher than the rear end. Each piece should be exactly over the piece underneath it and from 1 in. to 1½ in. apart from pieces on each side, for say 4-in. lumber, increasing this space up to 3-in. or 4-in. in lumber up to 12 in. wide. Cross pieces should be the same as the balance of the stack in lumber and timber 1 in. to 4 in. thick; in timber 6 in. thick and over this plan would run the stack too high, and 1-in. or 2-in. strips of waste lumber can be used. These cross pieces should be put on every layer, about 4 in. apart, and the front piece should project ½ in. to ¾ in. over the ends to protect the stack from sun and rain.

Be sure that the center bearings of each stack are not lower than the end bearings. The lines should be straight to avoid sagging and the consequent accumulation and retention of dampness. Be sure that the cross pieces are exactly over each other, else you will have crooked lumber. And be sure and don't use decayed or rotten lumber for cross pieces or foundations, as doing so will contaminate the good lumber.

WORK ON THE BAGDAD RAILWAY.—The American vice-consul at Aleppo, reports that despite the great crisis prevailing there has been no diminution in the railroad progress of the country. The Jaffa-Jerusalem line, controlled by a French company, but whose 25 years' lease is about to expire, was taken over by the military authorities at the outbreak of the war. Work was immediately begun to connect this line with the Haifa-Damascus line, and in this way link the system with Aleppo (on the Bagdad line), and eventually connect with Constantinople. Equal energy has been displayed in the extension of the line from Aleppo toward Bagdad, on the German or Bagdad Railway.

*Abstracted from a paper presented before the storekeepers of the Atchison, Topeka & Santa Fe at Albuquerque, N. M., September 28, 1915.

Tables for the Distribution of Track Materials

Information Enabling a Gang to Unload Ties, Bolts, Spikes and Other Supplies from a Moving Train

By KENNETH L. VAN AUKEN

While unloading material cheaply and easily is important, it is equally important that the correct quantities be unloaded and that they be distributed so as to require a minimum of rehandling later. This is especially true when relaying rail, laying second track or putting in switches. A correct distribution can be obtained by noting the standard length of track rails and spotting the work train each time with respect to the rail joints; or by reference to the location of telephone or telegraph poles. The poles usually afford the more accurate and ready means for gaging distribution.

When unloading rails, whenever the work train is on the siding waiting for trains the gang should be kept busy setting the rails up end to end. If it is possible to have all the rails set up in this way, the distribution of angle bars and base plates, or joints can be gaged by the newly distributed steel. The tables given in this article have been worked up to give figures which can be used in distributing material by noting either the telegraph poles or the rail joints, for both 30 and 33-ft. rails. The figures in most cases have been carried out only to the nearest quarter keg, box, etc., so that they can be easily used by men who are not used to handling fractions.

Table 1 is for distributing ties for a new track. It is customary to take out several carloads at once and distribute the

TABLE 1: DISTRIBUTING TIES ACCORDING TO TELEPHONE POLES.

No. per Length	30-ft. Rails		33-ft. Rails	
	Telephone Poles 150 ft. Apart	Telephone Poles 200 ft. Apart	Telephone Poles 150 ft. Apart	Telephone Poles 200 ft. Apart
15	75	100	..	..
16	80	107	..	..
17	85	114	78	103
18	90	120	82	109
19	95	127	87	115
20	..	..	91	121
21	..	..	96	128

gang on the various cars. The train is generally moved about one train length for each spotting, a man being sent ahead to make a chalk mark on the rail joint at intervals which give the nearest

should be on that basis; then, if it is unnecessary to replace all of the joint ties, the new ties can be kept for ordinary renewals near the same location.

Possibly the best method of distributing ties for relaying (unless some parts of the section need more renewals than others) is to count the number of ties and distribute them uniformly over the entire section. Or the number per telegraph pole may be computed and that number should then be thrown off one at a time at approximately equal intervals between every two poles.

Table 2 gives the number of angle bars required per rail length, and per telegraph or telephone pole whether located 150 ft. or 200 ft. apart. It is sometimes easier to gage the distribution by telephone poles than by rail lengths, but if the rails have already been distributed, the best method is to throw off four angle bars and two joint plates, or two joints, for each rail.

TABLE 2: DISTRIBUTING ANGLE BARS OR JOINTS.

	Per Rail Length	Per Telephone Pole 150 ft. Apart	Per Telephone Pole 30-ft. rail 33-ft. rail	Per Telephone Pole 200 ft. Apart	Per Telephone Pole 30-ft. rail 33-ft. rail
Angle bars.....	4	20	18*	28	24**
Joints (or joint plates for angle bars).....	2	10	9†	14	12††

* 2 extras at every 10th pole.

† 2 extras at every 20th pole.

** 2 extras at every 8th pole.

†† 2 extras at every 16th pole.

It is not necessary to distribute any extra pieces, because these appliances are not so easily lost as spikes or bolts.

Table 3, for the distribution of track bolts, gives in its various columns the number of joints which one keg will full-bolt for either 30 or 33-ft. rails, and for either 4-hole or 6-hole joints. For instance, if 4 3/4-in. by 7/8-in. bolts are to be used on 100-lb. 33-ft. rails with 6-hole angle bars, column 2 in the table shows that there are 141 bolts to the keg, and column 8, that these will full-bolt 11 3/4 joints, and column 9, that it will bolt the joints between 2 1/2 telephone poles 150 ft. apart, or column 10, 1 3/4 telephone poles 200 ft. apart. In making the distribution

TABLE 3: DISTRIBUTING TRACK BOLTS.

Kind	No.-per 200-lb. Keg	4-hole joints—one keg will full-bolt				6-hole joints—one keg will full-bolt			
		33-ft. rails		30-ft. rails		33-ft. rails		30-ft. rails	
		Joints	Telephone Poles 150 ft. Apart	Telephone Poles 200 ft. Apart	Telephone Poles 150 ft. Apart	Joints	Telephone Poles 150 ft. Apart	Telephone Poles 200 ft. Apart	Telephone Poles 150 ft. Apart
3/4 in. x 3 1/2 in.	255	31 3/4	7	5 1/4	6 1/4	20	4 1/4	3 1/2	4 3/4
3/4 in. x 4 in.	237	39 1/2	6 1/2	4 3/4	5 3/4	19 3/4	4 3/4	3 3/4	3 3/4
3/4 in. x 4 1/4 in.	168	21	5 3/4	3 3/2	4 3/4	14	3 3/4	2 3/4	2 3/4
3/4 in. x 4 1/2 in.	162	20 1/4	5 1/2	3 3/4	4	13 1/2	2 3/4	2	2 3/4
3/4 in. x 4 3/4 in.	141	16 1/2	4 1/2	2 3/4	3 1/2	11 3/4	2 1/2	1 3/4	2 1/2
1 in. x 4 3/4 in.	119	14 3/4	4	2 3/4	2 3/4	9 3/4	2	1 1/2	2 1/4
1 in. x 4 1/2 in.	114	14	3 3/4	2 3/4	2 3/4	9	2	1 1/2	1 3/4
1 in. x 4 1/4 in.	109	13 1/2	3 3/4	2 3/4	2 3/4	9 1/2	2	1 1/2	1 3/4
1 in. x 5 in.	106	13	3 1/2	2	2 1/2	8 3/4	1 3/4	1 1/4	1 3/4
1 in. x 5 1/2 in.	103	12 3/4	3 1/2	2	2 1/2	8 1/2	1 3/4	1 1/4	1 3/4
1 in. x 5 3/4 in.	100	12 1/2	3 1/4	2	2 1/2	8 1/4	1 3/4	1 1/4	1 3/4
1 in. x 6 in.	98	12	3 1/4	2	2 1/4	8	1 3/4	1 1/4	1 3/4
1 in. x 6 1/4 in.	94	11 3/4	3 1/4	1 3/4	2 1/4	7 3/4	1 1/2	1 1/4	1 1/2
1 in. x 6 1/2 in.	91	11 1/4	3	1 3/4	2 1/4	7 1/2	1 1/2	1 1/4	1 1/2
1 in. x 6 3/4 in.	87	10 3/4	2 3/4	1 3/4	2	7 1/4	1 1/2	1	1 1/4

Sizes of Bolts to go with Plain Bars of the Following Sections:
45 to 67 lb. 70 and 75 lb. 80 and 85 lb. 90 and 100 lb.
3 1/2 x 3/4 in. 4 x 3/4 in. 4 1/4 x 3/8 in. 4 3/4 x 3/8 in.

Sizes of Bolts to go with Patented Joints:
45 to 67 lb. 70 and 75 lb. 80 and 85 lb. 90 and 100 lb.
Continuous .. 3/4 in. x 3 3/4 in. 3/4 in. x 4 in. 3/4 in. x 4 1/4 in. 3/4 in. x 4 1/2 in.
Bonzano .. 1 in. x 4 1/4 in. 1 in. x 4 1/2 in. 1 in. x 4 3/4 in. 1 in. x 4 1/2 in.
Wolhaupter .. 1 in. x 4 1/4 in. 1 in. x 4 1/2 in. 1 in. x 4 3/4 in. 1 in. x 4 1/2 in.
100 per cent. 1 in. x 4 1/4 in. 1 in. x 5 in. 1 in. x 5 1/4 in. 1 in. x 5 1/2 in.
Weber .. 1 in. x 5 1/4 in. 1 in. x 6 in. 1 in. x 6 1/4 in. 1 in. x 6 1/2 in.

equivalent to the train length. The number of ties to be unloaded from between telephone poles for various spacings can be determined from Table 1. The table is not directly applicable to the distribution of ties for relaying. It is rather general practice to provide new ties for every joint, and the distribution

it is impossible to divide up the kegs, so that with telephone poles 150 ft. apart, one keg should be thrown off first with an interval of two telephone poles and then with an interval of three telephone poles, alternating this way throughout the distribution. The table provides for a small surplus in each case.

The kegs should be thrown off as nearly as possible at equal intervals, and should be rolled off the car endways; if they hit on the sides they may run down the embankment into the ditch.

Nut locks are usually furnished in boxes of 1,000. Table 4

TABLE 4: DISTRIBUTING LOCK NUTS.						
Nut locks—1,000 in a box—one box will furnish nuts for						
4-hole joints—8 nut locks			6-hole joints—12 nut locks			
Joints	Telephone Poles 150 ft. Apart	Telephone Poles 200 ft. Apart	Joints	Telephone Poles 150 ft. Apart	Telephone Poles 200 ft. Apart	
33-ft. rail..	124	27½	83	18½	14½	
30-ft. rail..	124	25	83	16½	12½	

gives the number of joints, measured by telegraph poles, for which one box will provide nut locks, the left half for 4-hole joints requiring 8, and the right-hand half for 6-hole joints requiring 12. A few nut locks are likely to be lost, so it is advisable (for instance in columns 3 and 4, top row of figures) to unload a box of nut locks every 27 telegraph poles 150 ft. apart, or every 20 telegraph poles 200 ft. apart.

Table 5 gives the number of track spikes, of the sizes commonly used, in an average keg of 200 lb. The number of rail lengths which one keg will full-spike is shown in columns 4 to 10, inclusive. This is for building a new track. For relaying it is the practice to provide new spikes for only part of the work and to require the gangs to use many of the old spikes.

TABLE 5: DISTRIBUTING TRACK SPIKES.									
Size, Length Measured Under Head	Average No. of Keg of 200 lb.	Rail Used. Weight per Yd. lb.	One keg will full spike-rail lengths						
			15 ties per rail	16 ties per rail	17 ties per rail	18 ties per rail	19 ties per rail	20 ties per rail	21 ties per rail
5½ in. x ¾ in....	300	75 to 100	5	4½	4¼	4	3¾	3½	3¼
5½ in. x 9/16 in..	375	45 to 75	6¼	5¾	5½	5	4¾	4½	4¼
5 in. x 9/16 in..	400	40 to 56	6½	6¼	5¾	5½	5¼	5	4¾

It is best to make the distribution in the same way as for ties—to count up the number of kegs and distribute them at equal intervals. If, however, it is planned to provide all new spikes except for the one row which was left in the ties, one keg will spike a third more rail lengths than is given in the table.

For relaying, the cheapest and best way to distribute the joint ties, spikes, angle bars and base plates or joints, bolts and nut locks, is to make up one train and do all this work at once. With careful work it is possible to make all this distribution without stopping, with the train traveling at a speed of 8 or 10 miles an hour. The cars of ties should be placed in the rear to reduce the damage of a possible derailment resulting from the ties falling on the track. The writer has used this method many times, however, without a single derailment.

Sometimes it will be policy to include the joint ties in the general tie distribution and wait until after rail is relaid to make tie renewals. In this case the section foreman will probably distribute the ties where needed previous to relaying.

WOOD PRESERVERS' CONVENTION

The annual convention of the American Wood Preservers' Association will be held at the Hotel Sherman, Chicago, January 18-20, 1916. The indications are that this convention will reflect the continued growth of this association.

Reports will be presented by standing committees on: Preservatives, Specifications for the Purchase and Preservation of Treatable Timber; Wood Block Paving; Plant Operation; Service Tests of Cross Ties; Service Tests of Wood Block Paving; and Service Tests of Bridge and Structural Timbers.

In addition, individual papers will be presented on the subjects of Wood Block Floors by Clyde H. Teesdale, Forest Products Laboratory, Madison, Wis., and also by F. W. Cherrington, chief engineer, the Jennison-Wright Company, Toledo, Ohio; Woods Suitable for Cross Ties by R. VanMetre, the Joyce-Watkins Company, Chicago; The Quantity of Zinc Chloride Required per Tie or Per Cubic Foot of Timber and the Method of Determining the Strength of the Solution by W. F. Goltra, president of the

W. F. Goltra Company, Cleveland, Ohio; The Types of Fungi Which Attack Railroad Ties by Herman Von Schrenk, consulting timber engineer, St. Louis, Mo.; The Creosote Oil Situation by G. A. Lembcke, Lembcke, Von Bernuth Company, New York City; The Zinc Chloride Situation by William Townsley, Jr., the Grasselli Chemical Company, Cleveland, Ohio, and Creosoted Douglas Fir Bridge Stringers by O. P. M. Goss, consulting engineer, Seattle, Wash.

The annual banquet will be held on Wednesday evening. F. H. Newell, professor of civil engineering, University of Illinois, and formerly chief engineer, United States Reclamation Service, will be the principal speaker.

THE VALUE OF ORGANIZATION AND SYSTEM FOR MAINTENANCE OF WAY GANGS

By J. T. BOWSER

Maintenance of Way Dept., Queen & Crescent Route, Danville, Ky.

The success or failure of a maintenance of way department foreman, as of any other man in charge of men, probably depends as much on his ability to organize the forces under his supervision and to systematize their efforts, as it does upon his knowledge of the work to be undertaken. That being true, is not a great field being neglected through the lack of systematic effort on the part of operating officers to cultivate the organizing and systematizing ability among their foremen. There are, of course, many railroad officers who have adopted a definite policy along this line, and many more who handle their foremen along similar lines, but have no definite and clear cut motive, following habit and instinct rather than clearly established reasons.

It is the purpose of this article to attempt to crystallize what is, very probably, the general impression or opinion as to the value of having foremen who organize their gangs for the work at hand and systematize routine. What railroad officer has not a familiar mental picture of the straggling, hesitating manner in which many section gangs resume work after the passage of a train, or the confusion and multiplicity of orders when the gang arrives at the work. Compare this picture with one of the gang, the foreman of which knew or had been taught the value of system. Each laborer then has a definite duty in each class of work, and he starts by force of habit. There is no loss of time arranging men, and there is no interference with each other. The foreman probably states what class of work is to be done and the laborers drop naturally into their places.

The work of an organized gang is not only done faster but better. Who will say that a man who has plenty of room to work, who knows what he is doing and what he is going to do, will not do better work than the man crowded up through lack of proper spacing, who skips from one thing to another, and who never knows or cares what comes next. From these men come the foremen and such training is invaluable. Discipline is better; a man is more contented and takes more pride in his work when his efforts are well directed and when he is accomplishing something.

Many foremen handle their gangs in this manner without really knowing what they are doing. They simply know they can accomplish more. Explain it to them, get them to thinking. If first efforts come spontaneously they should be able to make a great deal more progress when they know the reason, and begin to think about it. Such men are valuable and should be cultivated carefully. Watch apprentices and young foremen, get them started right, and explain; the whys are often as important as the hows.

The foremen's meetings afford excellent opportunities for officers to explain such methods to the foremen. It cannot be expected, however, that the seed planted at such a meeting will bear fruit without cultivation. It is probable that the supervisors are more or less gifted along this line. With a few talks and some encouragement the idea will crystallize in their minds and they will then be able and anxious to create and foster the growth of organized and systematic work among the foremen.

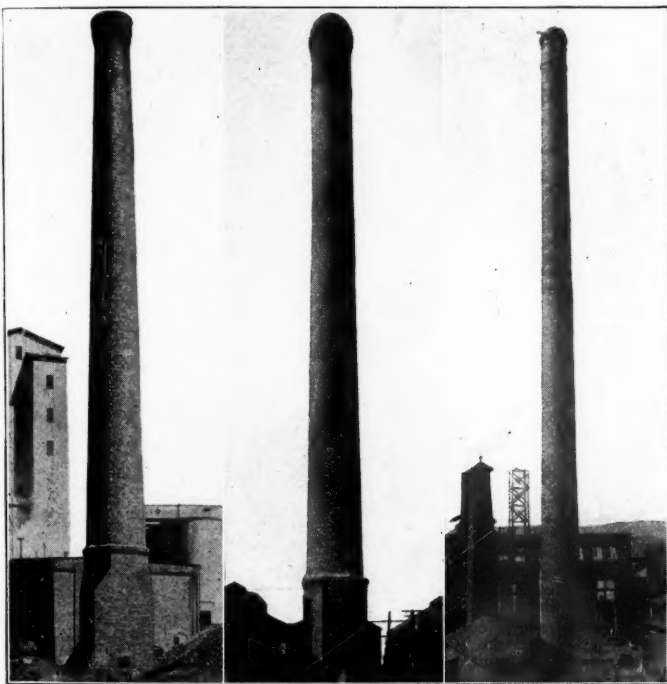
Design and Construction of Chimneys for Railways

Discussion of Types in Use and Points Considered in Deciding on Details of Chimneys for Boiler Plants

A great deal of power is generated by railways in steam plants exclusive of that in locomotive boilers. These stationary installations at engine terminals, docks, stations, shops, pumping plants, elevators, etc., depend on chimneys for the necessary draft, so that, in the aggregate, the problem of selecting a type of construction for such chimneys that will be dependable under all conditions and will have the lowest annual charge becomes one of considerable importance. On account of the special features involved in the design of chimneys and the relatively small number built by any one road, few railway men consider the subject thoroughly, depending to a considerable extent on the reputable builders of chimneys for details. It is hoped, therefore, that the following discussion will be of interest and value.

TYPES

In general, chimneys for the purpose considered are of three types, steel, brick and concrete, although at least one combination type has been developed, utilizing masonry and reinforced



- (A)—A Tapering Radial Brick Chimney 163 ft. High and 7 ft. in Diameter, Built for the Atchison, Topeka & Santa Fe Grain Elevator, Chicago, by the Heine Chimney Company, Chicago.
- (B)—A Radial Brick Chimney 175 ft. High and 9 ft. 6 in. in Diameter, Built for the Consolidated Gas, Electric Light & Power Company, Baltimore, Md., by Bergen & Lindeman, New York City.
- (C)—A Radial Brick Chimney 200 ft. High and 7 ft. 6 in. in Diameter, Built at the Chesapeake & Ohio Shops at Huntington, W. Va., by the Wiederholdt Construction Company, St. Louis, Mo.

concrete. Of these, steel and brick date back the farthest. Independent chimney structures were developed about the beginning of the nineteenth century at practically the same time in several European countries. The early structures of brick were usually square and were designed by "rule of thumb," in spite of which condition chimneys 90 years old are not uncommon in some parts of Europe. In the development of this type of construction, octagonal and later circular designs were adopted, the latter being the most economical in the use of material and the most advantageous in producing draft, as all dead air space in the corners is eliminated. It also offers less resistance to wind and has a greater moment of resistance than the square section.

The radial brick was a natural result of the development of circular chimneys in order to facilitate the construction of a

satisfactory wall. Also, an account of wide variations in the quality of ordinary brick, some of the builders began making special brick with perforations to insure thorough burning and the elimination of soft centers, resulting in a product of uniform quality. The various companies building such chimneys date the beginning of this type from 25 to 50 years ago, the first ones in this country being built about 15 years ago. Among the first in the United States are four 287-ft. by 17-ft. chimneys built about 1900 by the Alphons Custodis Chimney Construction Company, New York, for the Manhattan Elevated Railway in New York and still in service. Brick chimneys are generally recognized to be thoroughly satisfactory when properly designed and built.

Guyed sheet iron chimneys without lining are the cheapest type in use and are also the least durable. They can frequently be set directly over the boilers, being carried by a breeching hood. Permanent, self-sustaining, brick-lined steel chimneys are also used, being more expensive and requiring a flue of some sort to connect the boiler and the chimney. There is no definite dividing line as to size between guyed steel plate chimneys and self-supporting steel or masonry chimneys, according to the experience of George I. Bouton, consulting mechanical engineer, New York City. Some 5,000 to 6,000 hp. plants use the former, while others with only 500 or 600 hp. use the latter. Considering individual chimneys, the upper limit for a guyed steel chimney is about 7 ft. by 150 ft., the great majority of such installations being of a size not to exceed 5 ft. by 125 ft. In some locations it may be impossible to guy a chimney of large size, thus eliminating that type, or in other cases, it may be necessary to use a strut or stiff leg if the location and construction of adjacent buildings is favorable and the chimney is not too large.

In considering the advantages of steel chimneys in comparison with the more permanent types, it is important to estimate the probable life of the plant. For example, it might not be economy to install a permanent chimney with a life of more than 30 years in a plant which will be abandoned or entirely remodeled in 10 or 15 years. The average life of a guyed steel chimney is variously estimated up to 10 years. In some cases such chimneys built of 3/16-in. or 1/4-in. plates have failed in six or seven years, while in other cases chimneys with even lighter metal have been in service for 12 to 15 years. It is not customary to paint a chimney on the inside after it is put in service, and for this reason one used continuously will have a longer life than one which is out of service during a part of the year, or for considerable periods at a time. A chimney should be painted externally at least every two years. Local atmospheric conditions must also be considered in adopting a steel chimney as under certain conditions, such as proximity to salt water, the steel plates are attacked more quickly.

Concrete chimneys have been built in this country for about 25 years, although it is only in the last 12 to 15 years that their use has been extensive, and only during the last 7 years that tapering concrete chimneys have been developed. In general, the cost of concrete construction is from 10 to 30 per cent less than brick and about the same as self-supporting steel. On account of the thinner walls, concrete is lighter than brick, making it easier to provide suitable foundations under some conditions. In order to secure greater permanence, concrete chimneys have been used in some cases to replace steel stacks where brick could not be considered on account of its cost. When properly built, concrete has proved entirely satisfactory, some of the oldest chimneys still being in service and having withstood windstorms, fires, etc.

A combination type built of special fire clay tile filled with

concrete and reinforced with horizontal and vertical steel bars, is built by the Wiederholdt Construction Company, St. Louis, Mo. The advantages claimed for this chimney are that it does away with forms used in building concrete chimneys and has the advantage of steel reinforcement over many brick chimneys. This type has been built for about eight years.

The size of a chimney depends on the size of the boiler plant and the amount of draft required. For the average flue gas temperature the height of a chimney should be about 160 ft. for each inch of draft. The cross section is fixed by the amount of gas to be passed at a velocity that will not be excessive. This area varies directly as the weight of coal burned per unit of time and the number of pounds of air supplied per pound of coal and inversely as the square root of the draft. It is customary in figuring on the capacity of a chimney to assume a 2-in. film of gas lining the stack. Ordinarily no difference in dimensions is made between the different types, although the advocates of steel and concrete construction lay stress on the absence of leakage and in addition the builders of steel emphasize the decreased friction in that type, while those who favor brick call particular attention to the low factor of radiation and convection in a masonry wall, tending to reduce the loss of heat in this way. Municipal regulations, particularly where smoke departments are maintained, occasionally govern chimney sizes and must be investigated. As the details of design are comparable only for chimneys of the same general type, the following discussion is divided to cover the three forms of construction in most general use.

STEEL

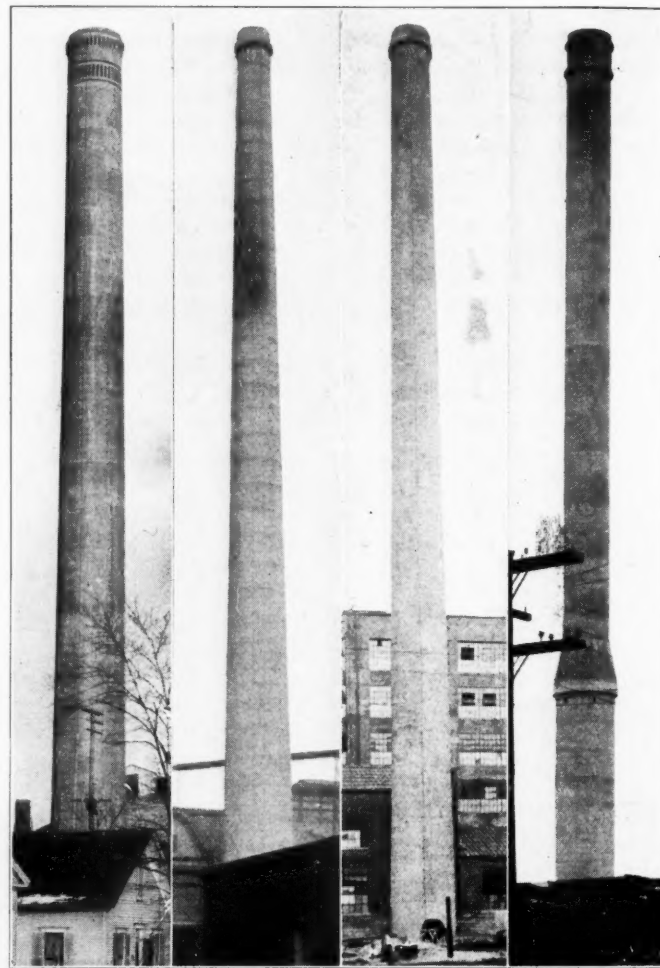
The thickness of the plates used in guyed steel chimneys varies with the diameter. Ordinarily good practice fixes this standard at No. 12 B. W. G. for 30-in. to 36-in. diameters, No. 10 B. W. G. for 42-in. to 54-in. diameter, 3/16-in. for 60-in. to 72-in. diameters and 1/4-in. for 78-in. diameter and larger. Lighter plates may be used if the plant is of a temporary nature, but the saving is inconsiderable, as, for instance, the difference between 3/16 in. and 1/4 in. plates for a 6-ft. by 150-ft. chimney would only amount to about \$250. The wind pressure is ordinarily assumed at 30 lb. per sq. ft. of exposed area. The load on the guy wires can be readily calculated on this basis from the diameter of the chimney, the exposed height, the distance from the base to the center of pressure and from the base to the connection with the guy and the angle of inclination of the guy with the horizontal. A 6-ft. by 150-ft. chimney with the lower 25 ft. protected, for example, would require two sets of guys placed 90 ft. and 120 ft. from the base, each set having four wires. For such a chimney the ordinary 1/2-in. galvanized steel wire strand frequently used for chimney guys, having an ultimate strength of about 8,500 lb., would be rather light and it would be advisable to use special strands of high tensile strength steel. On small chimneys, one set of three or four guys is sufficient.

The method of anchoring the lower ends of the guys varies widely and faulty anchorage has been the cause of many failures of chimneys of this type. Parts of buildings are frequently used for anchorage, in which case the details vary with local conditions. When a guy is anchored by connection to the ground but it is necessary to attach it above the surface, a stub, usually consisting of a heavy timber with planking across it, is used. This stub may be placed 7 to 10 ft. in the ground as required by local conditions. Where the guy can be brought to the ground a convenient anchorage is a block of concrete perhaps 3 ft. by 3 ft. and 6 ft. deep with an eyebolt projecting from the upper surface. If the chimney is not carried on the boiler setting, a concrete slab is usually used for the foundation, this slab ordinarily being 12 in. greater in diameter than the chimney and extending about 6 in. above the adjacent surface. Its depth, of course, depends on local conditions, a total thickness of 4 or 5 ft. being common.

BRICK

For brick chimneys the perforated radial brick has come into wide use. The blocks are ordinarily much larger than common

brick, thus reducing considerably the number of mortar joints which are the critical point in this type of construction. Various sizes of these blocks allow a wide range in wall thicknesses and radii and the perforations, in addition to securing a more even burning of the interior of the blocks, provide a means of locking the blocks together as the mortar is worked into them in laying up the wall, and they also provide a dead air space in



- (A)—Tapering Concrete Chimney 225 ft. High and 12 ft. in Diameter, Built by the General Concrete Construction Company, Chicago, for the Indiana & Michigan Electric Company, South Bend, Ind.
- (B)—A Tapering Concrete Chimney 185 ft. High and 6 ft. in Inside Diameter at the Top, Built by the Weber Chimney Company, Chicago, at the Nonconah Shops of the Illinois Central, Memphis, Tenn.
- (C)—A Tapering Concrete Chimney 184 ft. High and 7 ft. in Inside Diameter at the Top, Built by the John V. Boland Construction Company, St. Louis, Mo., for the Excelsior Manufacturing & Supply Company, Chicago.
- (D)—Cylindrical Concrete Chimney 175 ft. High and 6 ft. in Inside Diameter at the Top, Built by the John V. Boland Construction Company, St. Louis, Mo., for the American Box, Board & Paper Company, Grand Rapids, Mich.

the wall, decreasing the rate of heating and cooling. A radial brick chimney weighs less than one of ordinary brick.

Frequently an engineer or architect desires a chimney to conform to the architecture of the station or other building for which it is constructed and in such instances other than circular shapes may be adopted. While this introduces difficulties especially with the use of radial brick the improved appearance frequently justifies the added trouble. The inside lining of the chimney is laid in the ordinary manner.

The large builders of radial brick chimneys either operate or control the brick yards in which their product is manufactured. In general, the clay used in the process must be highly refractory, and be low in iron and lime content and the blocks must be burned until well vitrified, producing a hard, non-porous material of high crushing strength. The crushing strength required by various makers ranges from 4,000 to 7,000 lb. per sq. in. One company has tried burning them until their crushing

strength was increased to about 11,000 lb. per sq. in., but this discolors the surface and makes them so hard that they will absorb no water, thus preventing the mortar from adhering well. H. R. Heinicke, Inc., New York City, uses bricks of four different lengths, 4, 7, 8 and 10 in., with a uniform height of $6\frac{1}{2}$ in. and a width of $4\frac{1}{2}$ in. at the face, this dimension varying at the back with the diameter of the chimney. These bricks absorb less than 10 per cent of water in 24 hours immersion. In the base, at least every fourth course is a header and in the shaft every second layer interlocks to break the joints in every layer. Horizontal steel bands are used in the base.

Bergen & Lindeman, New York City, use brick $4\frac{5}{8}$ in. high and $6\frac{1}{2}$ in. wide in five lengths, ranging from 4 in. to $10\frac{3}{4}$ in. Each size is made with different radii for use in chimneys of different size. The Alphons Custodis Chimney Construction Company, New York City, makes bricks ranging from 4 in. to 13 in. deep, having holes not to exceed 1 in. square, so that the mortar cannot fill up and destroy the air space. These bricks are made both with and without corrugations.

The Heine Chimney Company, Chicago, use a brick $4\frac{5}{8}$ in. high, made in six sizes, four of which are ordinarily used, the dimensions varying by 1 in. These bricks are made to interlock and are laid with horizontal reinforcing bands and vertical mortar pins, alternate courses being headers.

The stability of a chimney depends upon the assumptions made in design as to the wind pressure and allowable stresses in the material. The most generally recognized standard of wind pressure, 50 lb. per sq. ft. on a flat surface, is quite commonly

and 20 tons per sq. ft. for a height of 300 ft. This variation is made on the ground that in tall chimneys the rate of progress is slower and the mortar sets harder. The maximum allowable compression used by other companies varies between 15 and 25 tons, some of them allowing as high as 3 tons per sq. ft. in tension, while others are more conservative in this respect. On account of the variations in assumed pressures and allowable stresses the factor of safety in the various designs of radial brick chimneys ranges from $8\frac{1}{2}$ to more than 20.

Chimneys are designed according to ordinary principles of mechanics, making a tentative selection of the taper and determining the required thickness of the walls at intervals of about 20 ft. The selection of the taper giving the most economical design is a matter of repeated trial designs and experience, and the various chimney companies have evolved empirical rules for tapers and thickness for use in preliminary designs.

The minimum thickness of a brick wall is ordinarily fixed at $7\frac{1}{4}$ or $7\frac{1}{8}$ in., this thickness being increased one or two inches in steps which are ordinarily 20 ft. apart. The variable sizes of perforated blocks allow almost any desired thickness of wall to be built. One company uses a minimum wall thickness of $7\frac{1}{4}$ in. for diameters of 6 ft. and less, $8\frac{1}{4}$ in. for diameters between 6 and 12 ft., and $10\frac{1}{4}$ in. above 12 ft. The thickness of the wall at the base of the chimney when radial

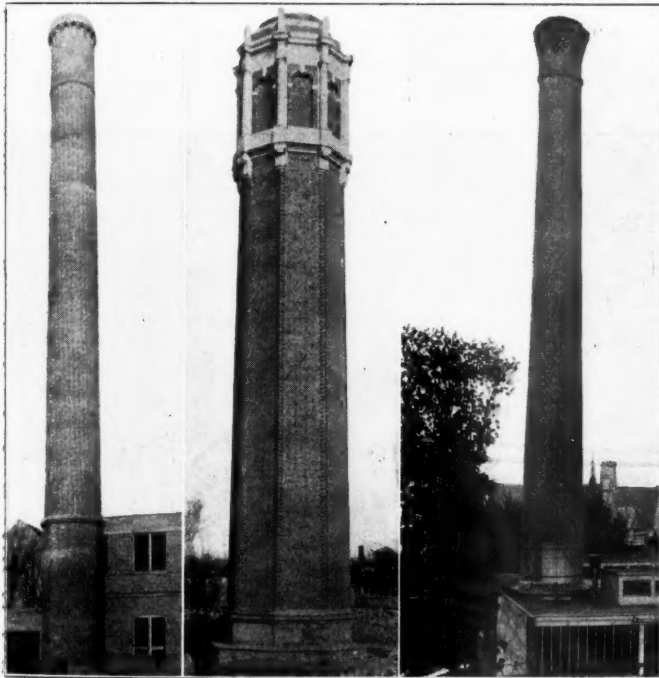
brick is used is determined by this company by the rule $\frac{H}{9} + 6$ in. where H equals the total height of the chimney.

Chimneys from 100 to 200 ft. high are tapered, the amount of this taper varying considerably. One company adds from 20 to 60 per cent of the top diameter to secure the bottom diameter; another increases the outer diameter $\frac{1}{4}$ in. per ft. when the ratio of height to top diameter is 10, and increases this increment as the ratio increases, up to $\frac{5}{8}$ in. per foot for a ratio of 40. Another company figures an average taper of about 4 ft. per 100 ft. for both sides, and another uses from 3 to 6 per cent taper on both sides. A variable taper has been used in several cases in order to improve the appearance and save material. The weight of a wall laid up with perforated radial brick averages 120 lb. per cu. ft.

Linings in vitrified brick chimneys are only required to protect the chimney walls from the extreme differences in temperature where the gases impinge against it. This leads to the general practice of lining only the lower part of the chimney and the space around the flue opening, though building ordinances in some cities definitely specify the height of lining to be used. It is common to use radial brick for the lining with an air space between the lining and the wall, though fire brick is sometimes specified.

The breech opening is a source of weakness. For this reason one company tries to make the width of the breech opening less than one-third the diameter of the chimney at that height, while another finds that this width should not exceed 0.6 of the clear diameter at the top, while the height of the opening is usually made 1.45 times that diameter, giving an area about 10 per cent larger than the top opening. This takes care of the greater volume of gases at the bottom of the chimney than at the top, due to the higher temperature.

Independent chimneys are ordinarily set on concrete foundations, which may be square, octagonal, round or of various other shapes. For round shaft, a round foundation gives the most uniform support, but, on account of the expense of building forms for such foundations, an octagonal shape is ordinarily preferred. One company usually builds square foundations, only cutting off the corners to form an octagon when the chimney is round from top to bottom. In order to minimize the danger of damage from lightning, chimneys are frequently equipped with lightning rods, differing greatly in detail. An ordinary rod costs \$200 to \$300, while some of the more elaborate forms exceed this cost greatly. Platinum tipped points, copper rods and cables leading down to a plate buried in the ground are some of the details frequently adopted. In some cases, interior



- (A)—Composite Brick Chimney Consisting of a Brick Facing, a Reinforced Concrete Filler and a Hollow Refractory Clay Tile Lining, Built for Kendrick Seminary, St. Louis, by the John V. Boland Construction Company, St. Louis, Mo.
- (B)—An Octagonal Common Brick Chimney 100 ft. High and 8 ft. in Internal Diameter, Built by Bergen & Lindeman, New York City, for Peabody College, Illustrating the Possibility of Harmonizing Chimney Design with Surrounding Buildings.
- (C)—Radial Brick Chimney Built by H. R. Heinicke, Inc., New York City, for Magill University, Toronto, Ont.

adopted although this is modified in many instances. One company uses 30 lb. per sq. ft. on the projected area, reducing this by 29 per cent for octagonal surfaces and 33 per cent for round. Another uses 50 lb. for flat surfaces, 35 lb. for octagonal and 25 lb. for round, while still another varies the assumed wind pressure and stresses with the height, the limiting figures for a round surface being 17 lb. per sq. ft. for a height of 50 ft., and 23 lb. per sq. ft. for a height of 300 ft. This company varies the allowable stress between 7 tons per sq. ft. for a height of 50 ft.

ladders are provided when the chimney is built to gain access to the top and clean-out doors are usually required in the base.

CONCRETE

Concrete chimneys are ordinarily built with a minimum wall thickness of 4 to 8 in. at the top, depending on the size of the chimney. This thickness is increased toward the bottom at a rate depending on the stresses, one company using ratios of $3/16$ in. to $1/2$ in. for every 5 ft. of height. The companies building concrete chimneys figure the batter in different ways, one using an average of $3/4$ in. for 4 ft. in height, another 0.3 in. to 0.45 in. per ft., and another a batter of 1 to 56 for small chimneys and 1 to 80 for large ones.

The design of the section and the reinforcement required in the wall are ordinarily based on an allowable compression in the concrete of 350 lb. per sq. in., and a tension in the steel of 16,000 lb. per sq. in. One of the companies keeps the ratio of steel to concrete below 1 per cent.

The John V. Boland Construction Company, St. Louis, never places the vertical reinforcement more than 12 in. apart at the top, and usually from 3 to 4 in. center to center at the base. This company uses a horizontal reinforcement of one or two layers of A. S. & W. No. 23 triangle mesh or $1/2$ -in. or $5/8$ -in. rods laid 10 or 12 in. center to center, and provides additional reinforcing at the foundation, around the breech opening and at the top of the lining. Another company uses wire mesh for the horizontal reinforcement, the concrete being of a 1:2½:3 mixture, placed wet. The assumptions as to the wind pressure and the designs of foundations are practically the same for concrete chimneys as those described above for brick.

Concrete chimneys are ordinarily lined, although some have been built without lining, special provision being made in the design of the reinforcement to take up the temperature stresses. One company recommends a reinforced concrete lining built at the same time as the chimney wall, with a 4-in. air space at the bottom. Some linings of this type have been in service as much as 10 years with satisfactory results. Such a lining, however, costs more than a brick lining which is ordinarily used for one-third to one-half the height of the chimney and is covered by a concrete cap. The breech opening is ordinarily made with a width less than two-thirds the top diameter of the chimney, when wider openings are required, buttresses may be used. One company estimates that lightning rods for concrete chimneys cost from $2\frac{1}{2}$ to $7\frac{1}{2}$ per cent of the total cost of the chimney.

CONSTRUCTION

In the construction of brick chimneys, inside scaffolds are ordinarily used, the material being hoisted either inside or outside the chimney. If inside, a temporary opening must be provided at the bottom for entrance of material. In most cases the scaffolding is supported by cross pieces laid in niches in the wall, or by vertical timbers. These scaffolds are raised as soon as the walls have been built up to a height of 4 to 6 ft. above the platform. Brick chimneys can ordinarily be built at the rate of 6 to 8 ft. a day, although as much as 18 ft. has been completed by some companies. Specifications often limit the rate of construction to prevent application of too great a load on new brickwork. A maximum rate as low as 5 ft. per day has been specified.

In the construction of concrete chimneys, either wooden or steel forms may be used in addition to a scaffold similar to that described. The General Concrete Construction Company uses a scaffold of 4-in. by 4-in. or 6-in. by 6-in. verticals and 2-in. by 4-in. or 2-in. by 6-in. cross bracing and steel forms made in sections 5 ft. or 7 ft. 6 in. high according to the size of the chimney. This form is adjusted to the desired diameter by radial bolts, a new joint being formed for each move by punching the plates and bolting up the sections. As soon as one of the small plates which form the ring entirely overlaps the adjacent plate it is thrown out and the joint made with the next plate. These small plates are 33 in. wide and the adjustment is made with two bolts in each plate. These forms are practically

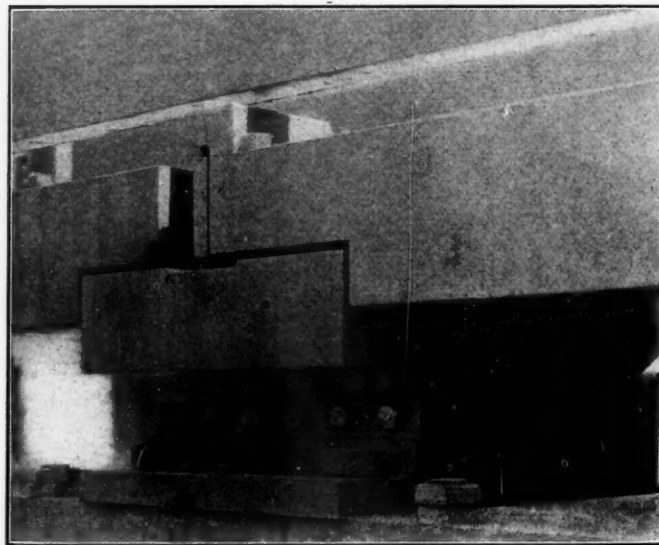
water-tight, allowing the use of a wet mixture. The surface is ordinarily washed with cement to give it a uniform color.

The Weber Chimney Company, Chicago, which has built many reinforced concrete chimneys, uses a unit form consisting of a series of wooden staves held together by castings and cables. Two complete forms are used, each 4 ft. 6 in. deep, which are placed one above the other alternately. Ordinarily the forms are moved once a day, although in the best weather on a single wall two moves may be made in one day. An inside scaffold is carried up with the work and the material is hoisted on the inside. The concrete is placed wet and spaded away from the face, the slight irregularities being finished off and the surface washed with Portland cement. A mixture of 1:2½:4 is used in the shaft, the gravel having a maximum size of 1 in., while in the foundation 1:3:5 concrete is used with 2-in. gravel. The work on concrete chimneys can be carried on successfully during the winter by covering the concrete with heavy canvas until it has set and providing heaters under the canvas and at the bottom of the shaft.

A PLATE FULCRUM TRACK SCALE

The Pennsylvania Railroad has installed in its gravity yard at East Tyrone, Pa., a track scale of a new type, which is a radical departure from previous practice in that neither pivots, knife-edges, bearing steels, loops or links are employed in the vibratory system to transmit the platform load to the indicating poise beam. The design of the scale was worked up jointly by A. H. Emery, of Glenbrook, Conn., and the engineering departments of E. & T. Fairbanks & Company and the Pennsylvania Railroad.

While this scale was installed as a matter of experiment, it has been in daily service since August 16, weighing from 400 to 500 cars a day, and the results so far obtained indicate the suc-



Connection Between Main and Longitudinal Levers

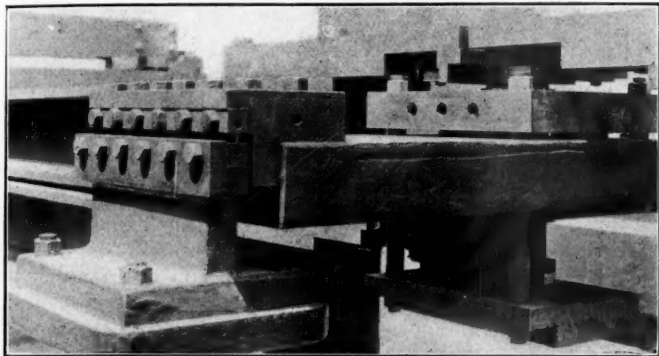
cess of the design. What is known as the "plate fulcrum" has been substituted for the regular knife-edge, pivot and bearing. This form of construction has been used successfully for years in large testing machines and in the dynamometer of the locomotive testing plant of the Pennsylvania Railroad at Altoona, but its application to a track scale is evidently new.

Since the scale has been completed a series of exhaustive tests, under both concentrated and distributed loads, have been conducted, and surprisingly accurate results have been obtained. The experiments thus far seem to have demonstrated that the plate fulcrum construction possesses many advantages, principal among which is the fact that the sensibility does not materially change under varying increments of load, it being almost the same under maximum load as under an empty balance.

The possibility of change in the power or adjustment of the

lever system of this scale is very remote, as there is no breaking down of the members forming the fulcrums, so that changes which ordinarily result from wear are eliminated, and after a scale of this type has once been properly installed and adjusted it is expected that little or no change will occur from usage. It should be understood that there is no motion whatever, either transverse or longitudinal, to the bridge or platform supporting the weighing rail, and, as a result, the action of the lever system is not affected by change in repose of the weighing platform, as the latter does not oscillate under moving loads.

The checking of the bridge is a unique feature. It is accomplished through the medium of massive stay-plates, instead of check-rods, the bridge being stayed from one end only to



Connection of Longitudinal Levers to Fifth Lever

take care of the longitudinal thrust and from one side only to take care of the transverse thrust. Hence the lengthening or shortening of the stay-plates (due to expansion or contraction) will not be reflected in the indicating poise beam by a change of balance, to the extent that is possible in a pivot and knife-edge scale with the generally accepted form of checking. The effect of the elastic bending of these stay-plates is not apparent in the calibration of the scale.

Another departure from previous construction, as ordinarily applied to track scales, is found in the fact that no parts of the scale are permanently bolted to the scale bridge proper. The bridge is supported by rollers which engage hardened plates, the rollers being placed intermediate between the bridge and the lever system, so that the load is centrally distributed on the plate fulcrums in the main levers. This feature also eliminates to a large degree the change in balance which is ordinarily manifested in a knife-edge and pivot scale as the result of change of position of the bearings when permanently bolted to the bridge. Another advantage is that the plate fulcrum is not disturbed by traffic over the platform, consequently neither dead-rail nor relieving gear are necessary, and the elimination of these factors simplifies the installation of the track arrangement, greatly reducing the element of danger, especially where motion weighing is practiced.

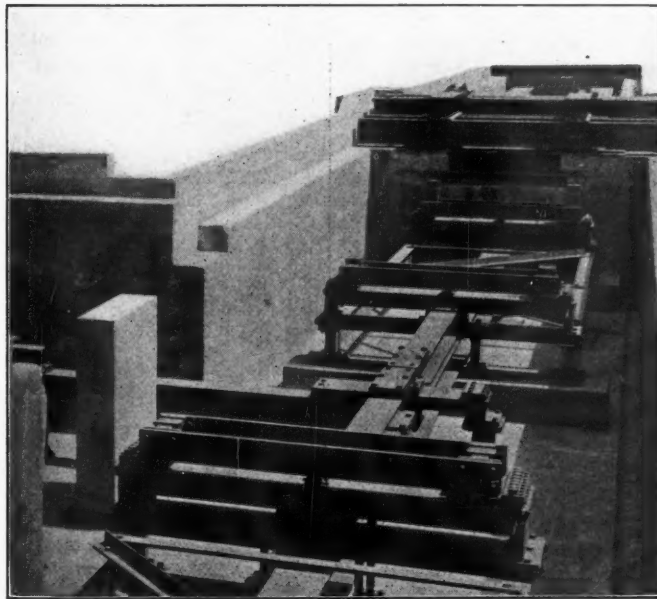
The scale installed at East Tyrone is 54 ft. long. It is located on a grade of 0.8 per cent. There are four sections in the scale, the primary system or main levers being arranged transverse to the direction of traffic, while the secondary system is arranged longitudinally. The total multiplication of the lever system up to the butt of the beam is 1,000, and the arrangement of the lever system is such that the load from each pair of main levers is transmitted independently to the fifth lever through the medium of the longitudinal levers, while the fifth lever is connected direct to the indicating poise beam. There are no compound levers in the scale which perform the function similar to what is known as the middle extension lever, a feature which simplifies the adjustment when calibrating the scale leverage.

The poise beam is directly connected to an indicator which moves over a graduated arc, the total travel of the indicator being about $2\frac{1}{2}$ in. on either side of zero. This facilitates the work of the weighmaster in obtaining a trial position of the main poise when weighing cars in motion, the vibration of the

indicator being largely controlled by a dash-pot with liquid displacement. The main beam is graduated to 240,000 lb. by 1,000-lb. subdivisions and the fractional beam to 1,000 lb. by 50-lb. subdivisions. An ingenious device has been applied to the beam, so that its capacity can be increased from 240,000 lb. to 440,000 lb. by the simple action of a lever, without the addition of loose weights.

The main girders are provided with slotted openings in the web, through which pass the girders for supporting the deck or platform. This is of the rigid type to permit the top flanges of the girders to project through the scale platform, thereby furnishing a continuous rail support, as well as a suitable water table, the aim being to secure a waterproof deck.

It remains to determine the effect of continued usage on the action of the scale, but its operation to date and the results so far obtained seem to justify the experiment to such an extent that the Pennsylvania Railroad has worked up another design of track scale of the plate fulcrum type having only two sections. This will not only simplify the design by the elimination of many levers and fulcrums, but is expected to determine the



The Scale Mechanism in Place in the Pit

relative merits of continuous articulated bridge girders. It will also simplify the methods at present employed when testing scales of four or more sections, where the distributing effect must be taken into account in connection with the final result.

ARGENTINE FLOODS.—The past two years have been a time of flood trouble in Argentina. Rain has generally been regarded as a great desideratum in the Argentine Republic, but during the past year the Argentine had far too much wet, with the result that the rivers and ordinary channels could not carry it off, and great lakes were formed. This did not tell adversely upon the track of the railways so long as there was no wind, but when high winds arose they raised the flood-water into waves, and the track was rapidly undermined and washed away. The engineering staff of the Buenos Aires Western Railway grappled with energy with the difficulties which had arisen, piling with wood laying sheets of galvanized iron where the banks were most exposed, and filling in washouts with cement in bags and brick-bats in wire netting. They managed in consequence to keep trains running in most cases, but this was done at considerable expense, the works carried out involving the company in a loss of \$614,125. What was done upon the Buenos Aires Western system was also done, more or less, upon the Buenos Aires Great Southern and the Central Argentine Railways.—*Engineering, London.*

Repairing a Tunnel Lining Under Difficult Conditions

Seepage Through a Disintegrated Brick Lining Prompted Repairing It, Using a Concrete Atomizer

The Chicago Great Western recently solved a difficult tunnel lining problem by means of the concrete atomizer. The tunnel is one-half mile long and is located at Winston, Ill., at the crossing of the divide between the Mississippi and Rock river drainage areas. Originally lined with timber, it was relined in 1886 with a semi-vitrified red brick without completely packing the space between the shell of brick and the old lining. The soft clay through which the tunnel was driven contains much water and, because of the extensive voids behind the brick work, the lining is subjected to considerable hydrostatic pressure. This resulted in excessive seepage and dripping of water. Weep holes were provided at various places to eliminate the water pressure and carry the water away, but, nevertheless, the bricks of the arch were constantly saturated. The portals are located favorably for the formation of drafts through the tunnel with the prevailing winds and for the last two years a fan ventilating system has been in service. As a result, freezing temperatures prevail within the tunnel throughout the winter months, as evidenced by the formation of great masses of ice.

Whether the result of freezing or of the chemical action of the combination of locomotive gases and water, the brick work has seriously disintegrated throughout the entire length of the tunnel, particularly in the arch, in certain portions of which large sections of the inner ring have been completely destroyed. The problem of remedying this condition was a matter of serious consideration on the part of the railway officers for some time. The present lining gives only the normal vertical and horizontal clearance, so that a new lining inside of the old one was out of the question. At the same time, the removal of the old lining, preparatory to replacing it with a new one, would have been a very expensive and hazardous undertaking because of the treacherous character of the ground through which the tunnel was driven.

As previously described in the *Railway Age Gazette* on March 19, 1915, page 675, the concrete atomizer is a device for the application of concrete in the form of finely separated particles in a blast of superheated steam, producing a concrete unusually hard, dense and impervious. The superheat prevents condensation of the steam in the presence of the wet concrete and hastens the chemical action of the cement. The atomizer consists of a mixer drum containing revolving paddles, which communicates by means of a piston valve with an "atomizing chamber" where the concrete and steam are brought together. A discharge pipe leads from this chamber to the place of application of the concrete. The concrete materials: 1 part cement, 3 parts sand and 2 parts pebbles to which 10 per cent. by weight of water is added, are placed in the mixing drum, where they are subjected to the ordinary agitating process by means of the paddles.

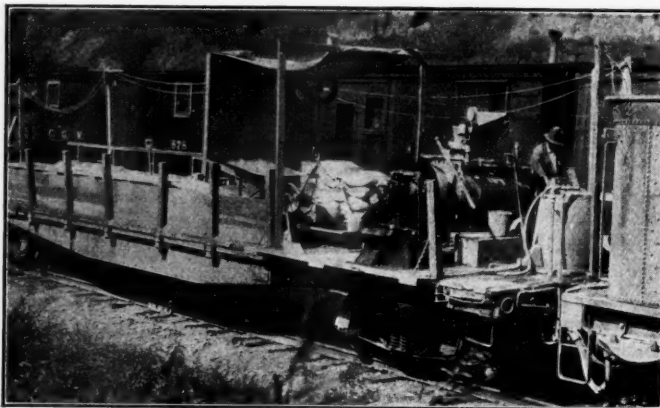
During the process of mixing, steam is admitted at a pressure of 80 lb. per sq. in. superheated about 50 deg. F. When the contents of the mixer drum are ready to be discharged, steam is admitted to the atomizing chamber from which it discharges freely through the discharge pipe. With steam pressure in the atomizing chamber at 30 lb. per sq. in. also superheated, the valve on the mixer drum is opened and the greater steam pressure within the drum, together with the worm-action of the paddles, causes the contents of the drum to discharge into the atomizing chamber. The latter is arranged in such a way that the concrete is "atomized" in the steam at an equalized pressure of about 40 lb. per sq. in. and immediately discharged into the discharge line. One interesting feature of the machine is the piston valve between the drum and the atomizing chamber, which is arranged in such a way as to give a minimum opportunity for the accumulation of small quantities of concrete which can set when the machine is not in use. Another feature is the con-

nection of small steam pipes to the shaft glands at each end of the mixer drum. By means of these the glands are kept at a higher pressure than the pressure within the drum, hence there is no tendency for the concrete materials to work outward along the shaft into the bearings.

The mixer is operated by a direct-connected V-type, 4-cylinder single acting steam engine. Wire-wound rubber hose of 1 3/4 in. inside diameter is used for transmitting the material, the hose couplings also being rubber lined. The use of this material seems especially suitable for wet concrete, as the wear is inconsiderable.

As the work on the Winston tunnel had to be carried on without interruption to traffic, it was necessary to place the entire plant on a construction train so that it could be taken in and out of the tunnel as required. This, of course, necessitated continuous work train service. The presence of a signal tower at the east portal, which was used in connection with the operation of a staff block through the tunnel, greatly expedited the movements of the work train.

The construction train consisted of three cars besides the engine and caboose and is illustrated in a number of the accompanying photographs. The mixer was located on the forward end of a

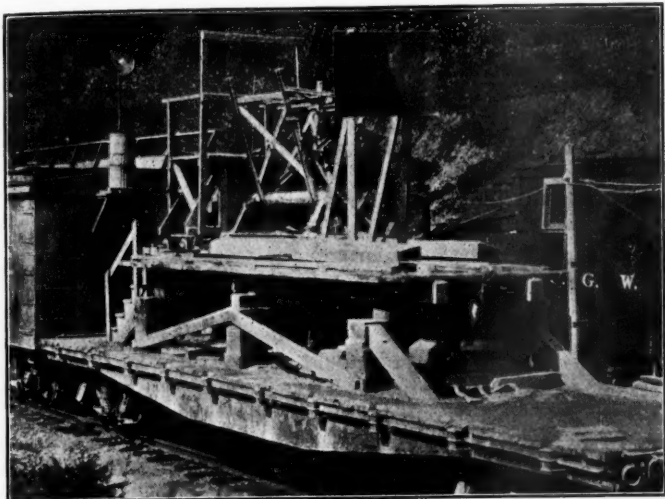


The Atomizer Car

flat car adjacent to the engine for convenient steam connection steam being supplied at 90 lb. by means of a reducing valve. The larger part of this car was utilized for the storage of the concrete materials which were measured and supplied by hand into the hopper of the mixer. Behind the mixer car was another flat car rigged up for the application of the concrete to the tunnel lining. A wooden platform about 20 ft. long was raised about 4 ft. above the floor of the car by means of blocking. Two light rails secured to this platform served as a track for a carriage containing the apparatus for the discharge of the concrete. On this carriage was a platform for the operator and a nozzle consisting of a piece of straight wrought pipe attached to a piece of reinforced rubber hose connected to the discharge line which ran along the side of the flat car. The nozzle was supported on a framework pivoted on a horizontal axis coincident with the center line of the car. By means of a small 2-cylinder reciprocating steam engine, this framework supporting the nozzle was made to swing from side to side in the arc of a circle. The entire carriage was also arranged for a longitudinal travel of about 10 ft. along the platform track by means of a windlass and rope which were operated by hand. A box car at the rear of the nozzle car was equipped with a platform protected by a wooden hand railing. This was used to clean the roof of the tunnel before the concrete was applied. Wire brushes and light pneumatic hammers were employed for this purpose, with the assistance of

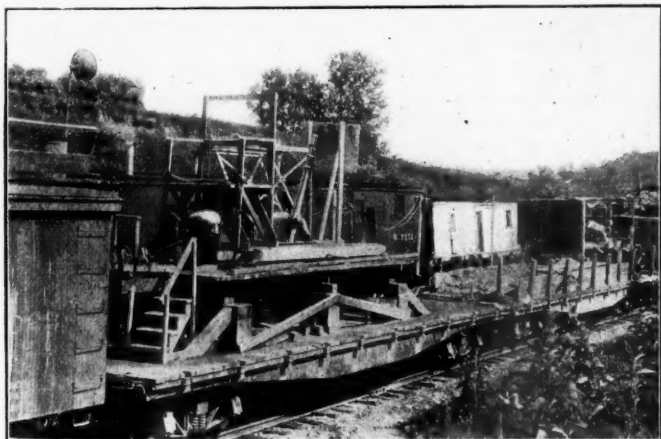
water which was supplied by a steam pump on the engine tank.

With the exception of an expert furnished by the owner, the work was carried on by the division carpenter crew of the railroad, which consisted of a foreman, three men cleaning the roof, one man at the nozzle, one at the carriage windlass, one at the atomizer and two loading and measuring materials. The concrete was applied on a 10-ft. length of the tunnel for a single position of the train. Water was run through the pipe and nozzle as a



The Nozzle Car

preliminary operation to clean the discharge pipe and wash off the soot deposited from the passage of the trains after the roof had been cleaned by the men on the box car. Steam was then run through the line to heat it to the required temperature and to insure flow through the pipe before the concrete was admitted. As soon as the flow of concrete was started, the nozzle operator started the engine which controlled the swing motion of the nozzle, while the windlass man slowly turned the windlass which moved the nozzle carriage along its track. The concrete was



The Construction Train. Nozzle Car and Part of Cleaning Car in the Foreground

thus deposited uniformly over a given width of the tunnel arch for the length of 10 ft. The nozzle operator controlled the flow of concrete, steam or water by means of a set of steam whistle signals.

In application the sand blows away until enough neat cement is deposited on the surface to make the sand stick. In a like manner, the pebbles bound off until enough mortar has been deposited to permit them to imbed slightly upon striking the surface. The pebbles and sand, however, perform an important office, even though they do not stay upon the surface. The impact resulting from the high velocity of the particles serves to compact the material solidly. This is evidenced by the manner

in which the fresh concrete was made to adhere to the dripping saturated surface of the old tunnel lining.

The speed of the concrete blast was controlled by the rate at which the hoppers in the mixer could be filled by hand, which was about one batch in five minutes. At this rate the concrete was applied as fast as three men could clean the old lining. The actual progress made in the tunnel was dependent almost entirely on the time that the tunnel was available for working between trains. A typical record was 262 ft. of lining for a width of 11 ft. in 6 hours. This required the use of 35 bags of cement. The entire work was completed in 41 days and has proven entirely



Placing Steam-Jetted Concrete on the Tunnel Lining

satisfactory thus far. The concrete presents a smooth surface and the leakage is negligible. The total cost of the work was \$4,600, of which \$1,700 represents rental of the machine and expert services and \$2,900 covers the labor, material, repair parts, work train service and expense of plant.

The concrete atomizer process is owned by Harold P. Brown, New York City, who leased the apparatus to the Chicago Great Western and had general supervision over the work. For the railway company, the work was under the direction of C. G. Delo, chief engineer, and I. F. White, division engineer, maintenance of way.

TURKEY'S RAILWAY STRATEGY.—According to an article in a recent issue of the *Journal des Débats*, Meissner Pasha, the German engineer who built the Hedjaz Railway, has been entrusted with the construction of a new strategic line, which it is hoped to use in connection with a second attack on Egypt. As far back as last May, this railway was already said to have reached Lydda, on the Jaffa-Jerusalem line. Rapid construction has been made possible by taking up tracks already laid on other railways, and 270 miles of track intended for the Medina-Mecca section of the Hedjaz Railway have similarly been "lifted" for the construction of this line. Green eucalyptus sleepers have been used.

Efficiency in the Bridge and Building Department*

A Discussion of Some of the Important Principles Governing the Successful Prosecution of this Work

BY GEORGE W. REAR

General Bridge Inspector, Southern Pacific, San Francisco, Cal

The work of the bridge and building department is of such great variety that it covers almost all of the building trades and some of the mechanical trades as well. As the work is scattered over a large territory it is hardly to be expected that as great efficiency can be secured as where the work is concentrated.

THE MAN IN THE GANG

Before going into the conditions of labor, let us look at the personnel of the department, beginning with the men in the ranks. The mature man one hires usually has some drawback: He is a wanderer, or a chronic kicker, or has one or more of the many faults human nature is heir to. He often expends more energy hunting a job than he does in doing it after he secures it. He has probably made up his mind that a railroad job is a snap and tries to make it one. When men are scarce and work must be done, these men must be tolerated, but at a great loss of efficiency in the work.

The only alternative is to keep the good men that we have and hire young men and train them ourselves. This is the foundation on which we must build the department.

Why do men leave us? Assuming that we have trained the man, what do we lose when we lose his services? Perhaps the railroad does not lose much in dollars and cents, as he has probably earned all he received while being trained, but it has lost a very material part of the organization and the benefit of his service in the years to come.

One reason his training has not cost much is because no special pains have been taken to train him. He begins as a laborer, works a year or two and becomes a handy-man, then secures a few tools and becomes a mechanic. Is he encouraged to advance? Probably not. If he is energetic, smart or likely to become a valuable man, is he dropped or "hidden under a bushel" for fear he will displace some older man? Is he kept away from home for weeks at a time and considered a nuisance if he asks for transportation home often enough to keep up an acquaintance with his family or associates? Are his wages anywhere near what they ought to be? Are his living conditions good or even fair? Is he laid off whenever work is slack? In other words, is his job worth having? These are questions that must be looked squarely in the face. They have little or nothing to do with what work a man will accomplish, but they are of vital importance in determining whether or not we have any men at all.

Thousands of young men of fair education are looking for a start on a life career every year. Are we getting our share of them? Have we anything to offer them? On the answers to these questions depends the future efficiency of the Bridge and Building Department.

It is efficient now, probably more so than other departments, but it is so largely in spite of conditions, except where proper methods are in force. Conditions are nowhere ideal, but much has been done, mainly by individual effort.

If we are to get and keep good men we must: hire young men of good health, good habits and fair education; we must put them at unskilled work (if there is such a thing) and give them a chance to learn the work, for it is a trade or profession of its own; we must also pay them proper wages. What proper wages are, is open to discussion, but it does not help the department to have boys leave the farm and get more pay as brakemen to begin with than bridge and building men ever hope to get.

We must make their living conditions agreeable. If required to be away from home they should have good living accommodations. Some of these men spend half their lives in an outfit car. Don't crowd too many men in a car, but provide some privacy and arrange so that men who are congenial can be grouped together. We must not forget to feed them. Quantity and variety of provisions are not the only things to consider, for the way that they are served is an important item.

Let the men go home often. The man who sticks closest to civilization is the best citizen and the most valuable man. If circumstances permit, let him go home every night; don't keep him away for fear that the boarding camp will lose money or to save some clerk the trouble of writing passes. Consider transportation as a man's right and do not try to make him think that he is getting it as a favor. Treat the man as a human being and as an equal in everything except responsibility and authority, and make his job as secure as that of any other employee. He will be proud of his job and it will be easy to keep him.

Do not drive too close a bargain with him and do not expect to get more than you pay for. Men should be hired with as great care as those for any other department. A fair education should be insisted upon and a physical examination given. This examination should be governed somewhat by the trade he is to follow, without blindly turning down all applicants who are not perfect, but it should be strict enough to cull out all those not physically fit to do a day's work.

These employees should be considered as employees of the railroad and not of a gang. They should be transferred frequently from gang to gang and given an opportunity to learn the standards of work and the methods used by different foremen. The man himself should show a desire to become a real railroad employee, to learn the business and to put up with its inconveniences without "growling."

If the men in the gang are not congenial and willing to work together as a team, an effort should be made to locate the reason and change the men around or discharge those who are not willing to pull with the rest. When there is friction in a gang there is always some cause, and this should be located and removed.

It is not to be expected that any method of handling men will eliminate all dissatisfaction, for the millenium is not yet at hand, and while human nature is what it is there will be men who look on every action of their superiors with suspicion. However, if the gang is treated in the spirit of fair play, the majority of the men will play fair.

THE FOREMAN

The gang must be made to pull together, for co-operation is the real reason for working men in gangs. The older men should be given charge of the apprentices, and if the gang is large enough it should be divided into groups of five or six men each, each group in charge of one of the older men, who, in addition to being a good workman, has shown some of the qualities of leadership.

The foreman looks to these leaders to keep their fellow workers properly employed while they themselves are in training for positions as foremen and should be given an opportunity to familiarize themselves with the bookkeeping required of foremen. It is not to be expected that all of these men will make good foremen, but enough of them will have the proper qualities to provide a plentiful supply, and it will not be necessary to go outside of the employees to secure them.

In picking men for foremen those should be selected who are

*A paper presented at the annual convention of the American Railway Bridge and Building Association held in Detroit, Oct. 19-21.

fair-minded, patient and good judges of human nature, in order that they may treat their men properly and secure their respect and confidence. A foreman should have the courage of his convictions, be energetic, resourceful, and have sufficient red-blood to be a leader. At the same time he should be quiet, firm and cool-headed so that neither he nor his men will "blow up" in an emergency. The loud-mouthed, profane driver may be necessary with mules and oxen, but is out of place with intelligent human beings.

A foreman should be honest, loyal, painstaking, reliable, sober and willing, so that he may be a fit representative of the company that employs him and command the confidence of his superiors. He should be studious and observing, that he may advance in his profession and become capable of added responsibility.

In considering the handling of men it may be well to remember a few established principles. There is a limit to the amount of work that can be got out of him. The value of a man does not lie in his physical force, but in his mental capacity or ability to co-operate with other men using heads as well as hands. The system of handling men and work should be such that it would not depend on any individual to carry it out. There is no use in keeping a man who is not satisfied with the job and whose work is not congenial.

Foreman should be developed along definite lines, and where the system is in proper effect this will be accomplished by making the future foremen understudy the regular foremen. It is also advisable to have the future foremen placed directly under the eye of the supervisor for a time, so that he may be advised and instructed in details that otherwise might be overlooked.

In educating men for foremen, the following points should be given consideration:

He should know that he cannot do all of the work himself, and that it would be useless to try, neither should he think that because he is foreman he should not do any manual labor. The amount of manual labor that a foreman should do has always been a matter of argument, but common sense will show that this depends on the number of men in the gang and the class of work that is being done. The foreman in the gang is employed to see that each man in the gang does his share of the work and the nearer this result is attained the more efficient is the gang.

It is neither possible nor desirable that a foreman be given strict rules and instructions for every class of work, because this results in making him a mere machine. A foreman should be given enough leeway so that he will not lose his enthusiasm, but will feel that the work depends on him and not on the fact that he is carrying out some one else's ideas and instructions.

The successful foreman is one who keeps harmony among the men. His men work "for him" and not "because of him." A good foreman does not have to stand over his men and drive them with threats, neither does he have to discharge a man occasionally to make the others fear him. No man has ever accomplished much through fear.

A foreman should arrange the work so that there will be competition among the men. Have groups of men at the same kind of work so there will be a speed contest. This contest may only be subconscious, the men hardly realizing that there is a contest or rivalry, but it will result in an increased amount of work. It must be remembered, though, that it is the steady, regular work that counts and that spectacular bursts of speed usually "fizzle" before long. These "high-speed plays" are all right if the work is of an emergency character and will be over in a few hours, but as a steady thing they are out of place. A man may be ambitious enough in the morning, but a few hours' steady work with a "number two" will serve to subdue his energy. It is the man who can select a gait at which he can keep all day who accomplishes the most.

TOOLS

A foreman should realize that he is not being paid for muscle or a strong back, but for his head and what there is in it, and should employ every opportunity to use his head to save hard

work. Human energy uselessly expended cannot be replaced and it should be conserved where possible or economical. To conserve and make human energy effective, tools have been developed. Without tools little can be accomplished, so it is a waste of labor to try to work without them.

These tools are two general kinds, hand and mechanical. The hand tools may not be exactly labor-saving, but their use makes labor effective and they should be of the best class obtainable. Keeping them in proper shape is a great aid to efficiency.

Mechanical tools are labor-saving devices, permitting the employment of steam or other power for work which would otherwise have to be done by men.

The locomotive crane is too expensive a tool for the ordinary bridge gang, but there should be enough of them on each supervisor's district to provide this equipment where needed. The modern car pile driver is a very efficient machine and each railroad should have enough of them to do their ordinary work and take care of emergencies. These drivers should be placed in the hands of efficient men and worked to as nearly full capacity as possible, as it does not pay to have them idle. With suitable attachments they can be used as light car derricks and their sphere of usefulness enlarged.

Almost every bridge gang can find efficient uses for a hoisting engine and their use should be encouraged. The gasoline engine has been developed to such an extent that it is very reliable. The present-day workmen are so well acquainted with them that there is no difficulty in finding someone to run them. They are very satisfactory for operating pumps, concrete mixers, etc.

Probably the greatest labor-saving device of the present day is the concrete mixer. An average bridge gang, doing ordinary work, will have considerable concrete to mix and to do it by hand, especially with men not used to it, is a back-breaking job. It is impossible to keep good mechanics if they are put at this kind of work very often. The small mixer taking a one-bag batch is the best for an average bridge gang. It should be self-contained and require no great amount of time to set it up. A mixer mounted on wheels or skids with a gasoline engine directly connected to it is best. It is almost criminal to mix concrete by hand when power is available.

Pneumatic riveting and boring tools are not used by the average bridge gang, but every gang doing work on steel bridges must use these tools to do good work. They are not only economical, but rivets driven by pneumatic hammers are better than those driven by hand and greater dependence can be placed on them. The motor car also adds greatly to the efficiency of a bridge gang, as the men can be taken to their work in less time and are in better physical condition when they get there. A bridge gang should be supplied with good jacks of proper size. The modern, ball-bearing screw jack is probably the best all-around jack, but each gang should also have some ratchet jacks for such work as they are suitable for.

Furnishing the tools is the duty of the superior officers, but their up-keep depends on the foreman. With proper tools and men, a gang is ready to go to work and its efficiency depends on how the men go at it. Where a gang is employed on one kind of work it is easy to get the job under way, but where the work varies in character it is usually hard to get it started so as to keep all hands profitably employed. This is where a competent foreman can make a good showing, and on the amount of headwork he uses will depend the efficiency with which he starts his work.

A foreman will soon realize that although all men are born free and equal they do not remain so. Although all of his men may be good, some of them may be better than others. Neither are all men equal in the variety of work they can accomplish. Having men of different characters and propensities, it is the foreman's duty to see that, as far as possible, each man is put at the work most suited to him, and on his ability to do so his efficiency will greatly depend.

A foreman should be careful to avoid doing one of his men an injustice. It is not enough to be just. Some things are better forgotten or overlooked.

THE SUPERVISOR

The department must have a head, and on this officer depends the efficiency of the division. To fill this position properly, a man must have special training and experience. He must be familiar with all the building trades, must keep up to date in the use of tools and labor-saving devices, and be an expert in the art of handling men. He must have all of the qualifications required of a foreman and in addition he should have the necessary qualifications to enter the diplomatic service.

His success depends on the regard in which his subordinates hold him, much more than that of his superiors. In handling men the most successful supervisor is the one who knows each man under him well enough to call him by his given name. He should see that his foremen understand his desires as to how the work is to be done, and, as few foremen are mind-readers, he should tell them explicitly.

It is always best to let a foreman handle the details of the work in his own way, if his way is anywhere near right, but there should be a clear understanding in regard to it, so that the work may go on properly from the beginning. Once the work is outlined, proper material and tools should be provided and enough material for a good start should be on hand before the gang begins work. Much inefficiency is the result of not having material and tools when required. A supervisor should go over the plans with the foreman and see that they are understood. He should see that the foremen are provided with all equipment to protect the men from injury and see that it is used. Men do much more work if they have safe stagings, stairways, etc., and are relieved from anxiety while at work. It is useless to expect a man to swing a hammer over his head if he is afraid of falling off a plank. He must have good footing to do good work.

A system of cost accounts tends greatly to efficiency. Each foreman should be required to report the labor cost of each job done and costs of similar work by the same or other foremen should be compared. It is not sufficient that these costs be taken from the auditor's accounts. They should be furnished by the foremen, as the fact that the foreman must work up the statement will cause him to be more careful in the handling of the work.

A supervisor should have gangs of proper size, properly equipped and located at the most convenient points, so that there may be no great loss of time in moving them around. These gangs should be organized to do all work of an ordinary character in their territories. Special gangs should be provided and specially equipped to handle the larger jobs of construction and reconstruction and such other special jobs that require special training and equipment.

The greatest incentive for men to do a good day's work is to have plenty of work in front of them. It is almost impossible to do efficient work when the job is about finished and no other work in sight.

The most important of all points tending to efficiency is regularity of employment. It is useless to try to perfect an organization if it is to be broken up every winter or as soon as the earnings fall off temporarily. When it is arranged so that the work can be carried on continuously and employment made permanent then, and then only, will there be a real foundation on which to build an efficient organization.

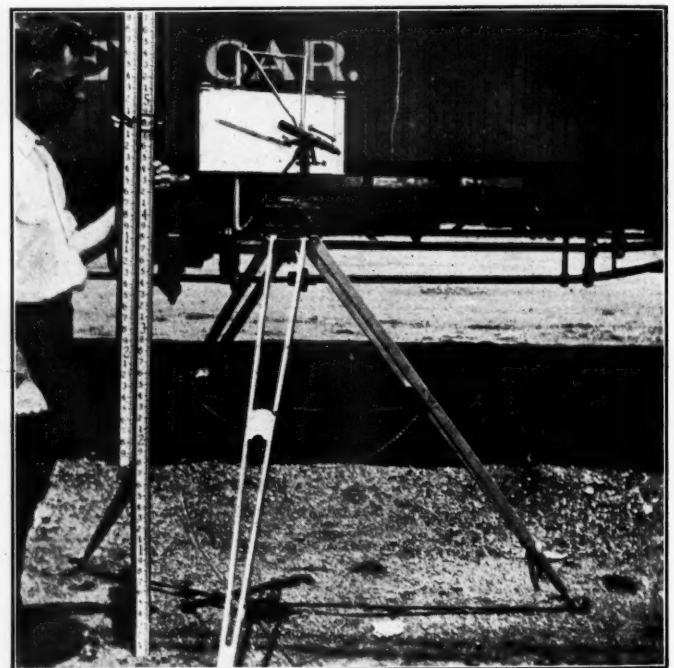
Finally, we must not lose sight of the fact that the real business of a railroad is to provide transportation, and that all other work is only incidental thereto. We must not allow our efficient methods to interfere with the running of trains. We have no money to waste, but it is nearly always necessary to depart from the most economical methods to avoid delays to trains, consequently we must consider efficiency to mean—the most satisfactory method of conducting a railroad as a whole.

INCREASED WAGES IN VICTORIA.—A request made by the Victorian Railways Union for an increase of 25 cents a day to employees, has been definitely refused.

A CROSS SECTION INSTRUMENT

The cross section work now being done on an extensive scale in connection with the federal valuation of railways has led to the invention of an instrument especially designed for the rapid taking of cross sections. This instrument consists of a telescope revolving in a plane parallel to a vertical aluminum board which carries cross section paper, and a graduated scale bearing on the surface of the paper and rotating with the telescope. The axle of the telescope is in a standard mounted on a leveling base, which also supports the frame of the board. The lower plate has a circular level, the upper one a tubular level, parallel to the plane of the board, and the instrument is mounted on a tripod with a quick leveling head. The legs are provided with shoes to rest on track rails.

The telescope is equipped with stadia wires spaced double the usual interval and readings are made from the center cross wire to the upper wire, thereby making one pointing of the instrument suffice both for direction and distance. A special rod used with the instrument eliminates corrections. It consists of a short rod hinged at the target to a longer rod, which is provided with a sight by means of which the rodman can always keep the rod



The Cross-Section Instrument and Rod

perpendicular to the line of sight. The instrument complete weighs about 18 lb.

To take a section, the instrument is set up and leveled, and the board and paper are adjusted to make the zero of the scale come to a convenient line on the cross section paper. A sight is taken on the rod, the telescope is clamped and the reading plotted on the scale. This is repeated for as many points as is necessary. When more than one setup is necessary, the procedure is to adjust the paper so that the zero of the scale will correspond to the point on which the instrument is set up.

Only two men are required to do the work, the instrument man and the rodman, thus at least one man is saved in the field party, and as the cross sections are plotted in the field, the time of plotting them in the office is saved. The instrument may also be used with a tape in place of the stadia, and with slight variations can be applied readily to tunnel cross sections. Although designed primarily for taking earthwork cross sections it would probably serve as well for topography. The instrument is being put on the market by Hoge & Flint, Louisville, Ky., and is now undergoing a test by valuation engineers of the southern district of the Interstate Commerce Commission.

General News Department

Two grain elevators of the Pennsylvania Railroad at Erie, Pa., were destroyed by fire December 10, together with about 500,000 bushels of wheat; estimated loss \$750,000.

The State of Pennsylvania has a new workmen's compensation law, and at a conference of the state board with railroad officers in Philadelphia on Monday, of this week, all of the principal railroads of the state announced their intention of accepting the provisions of the law.

The management of the Cleveland, Cincinnati, Chicago & St. Louis and the telegraph operators employed on the road have reached an agreement providing for increases in wages and changes in working conditions, which were made effective on December 1. The increase in wages will amount to about \$45,000 a year.

At Otisville, N. Y., on Monday evening last, a considerable number of passengers who had alighted from westbound passenger train No. 179, of the Erie road, were struck by eastbound passenger train No. 2, opposite, or nearly opposite, the station, and six or more were injured. Most of the passengers were thrown into a snow-bank. None of the injuries were fatal.

Senator Lea, of Tennessee, has sent to the Interstate Commerce Commission a petition asking for the investigation of charges that the Louisville & Nashville and the Nashville, Chattanooga & St. Louis furnish free passage to public officers in Tennessee, citing the report of the investigation which was made by the Interstate Commerce Commission in that state; and charging also that influential shippers receive favors.

Switchmen's Strike at Chicago

The enginemen, trainmen and switchmen of the Belt Railway of Chicago struck, on Tuesday of this week, causing a serious interruption of freight traffic. The reason given for the strike is that the railroad company had refused to run a train to carry employees to and from their work at the new clearing yard, southwest of the city; though the officers of the road had offered to provide a temporary train until such time as the men could move their homes to houses near the yards. The company had applied to the federal mediation board to take up the grievances of the men.

Newspaper "News" About a Railroad President's Salary

"SAN FRANCISCO, Dec. 10.—E. P. Ripley, president of the Atchison, Topeka & Santa Fe Railroad, whose salary is reported to have been raised from \$75,000 to \$100,000 a year, is now the highest steam railroad executive in the United States. Mr. Ripley's salary is said to have been increased on the occasion of his seventieth birthday, celebrated by a banquet of railroad officials at Chicago Oct. 30."—*Chicago Examiner*, December 11.

"E. P. Ripley, president of the Santa Fe Railroad, when questioned yesterday at his home in Santa Barbara, Cal., by a Herald representative regarding the report that his official salary had been raised from \$75,000 to \$100,000 a year, said that he knew nothing about any such increase."—*Chicago Herald*, same date.

St. Paul Electrification Tests

The Chicago, Milwaukee & St. Paul has been conducting elaborate tests during the past two weeks on its 2 per cent grades crossing the Rocky mountains east of Butte with the three electric locomotives which have been received. These tests included trials to ascertain the tonnage the locomotives would haul as well as the application of regenerative braking. Among the final tests was one on December 8, at which time two electric locomotives took a train of 48 loaded cars, 3,000 tons, from Butte up the 2 per cent grade to the summit of the Rocky mountains at a speed of 16 miles an hour and then continued down the descending grade on the opposite side. An interesting comparison with steam operation was secured by fol-

lowing this train with a steam train made up as regularly operated with 37 cars, 2,000 tons. This train was hauled by two road engines with a Mallet pusher. It ascended the grade at a speed of 9 miles an hour. The tests were conducted in the presence of President Earling and other officers and directors of the St. Paul. Until other locomotives have been received the three now on hand will be employed in pusher service over the 2 per cent grades between Piedmont at the foot of the eastern slope of the Rocky mountains and Butte on the west.

Trainmen's Brotherhoods Prepare for Eight-Hour-Day Campaign

The general chairmen of the Brotherhood of Locomotive Engineers and the Brotherhood of Locomotive Firemen and Enginemen, after a two-day meeting in Chicago, announced on December 11, that they had decided to join forces with the eastern and southern engineers and firemen and with the Brotherhood of Railroad Trainmen and the Order of Railway Conductors in the movement for an eight-hour day with time and a half for overtime. A general conference of the executive committees, including delegates from the eastern, southern and western organizations of the four brotherhoods was called to be held in Chicago on December 15, to frame the demands to be presented to the railroads.

The meeting of the western enginemen and firemen was presided over by Warren S. Stone, president of the Brotherhood of Locomotive Engineers, and W. S. Carter, president of the Brotherhood of Locomotive Firemen and Enginemen. It is understood that W. G. Lee, president of the Brotherhood of Railway Trainmen, and A. B. Garretson, president of the Order of Railway Conductors, participated in the meeting.

Timothy Shea, assistant president of the Brotherhood of Locomotive Firemen and Enginemen, who was a representative of the employees in the arbitration of the controversy between the western enginemen and firemen and the railroads, was quoted in the Chicago papers as follows:

"This time there will be no arbitration. The principle of arbitration is excellent, but it has been abused. There is no secret about what we are after. We will flatly demand an eight-hour day and time and a half for overtime. We may add other demands at our conference. If we do not get what we want we will walk out. Every railroad in the United States—more than 350,000 men—will be affected. At our meeting we will arrange details of the plan and will set a date for final action."

The New Haven Trial

The cross-examination of former president Charles S. Mellen was continued during the past week in the trial of the eleven New Haven directors in the Federal Court in New York. On December 9 Charles F. Choate, for the defense, asked of Mr. Mellen the question: "Did you at any time conspire with any one whatever to effect a monopoly?"

"I never conspired in any way, shape, or manner. I was trying to build up for New England an efficient system of transportation to obtain mileage so as to make it possible to distribute the cost of the terminals, which was tremendous, over as large a mileage as possible. We had no preconceived idea as to how this was to be brought about. It was a process of evolution. I do not know but that we should all have been scared to death if we had appreciated in our first step what the last step was to be."

On Friday the government counsel tried to offset the effect of some of the evidence brought out in the cross-examination of Mr. Mellen by the defense by showing the influence the railroad had with the state government of Massachusetts. Mr. Butts, for example, showed that Governor Draper showed T. E. Byrnes, then vice-president, a tentative draft of a message, but Mr. Mellen emphatically denied that he had helped Mr. Draper prepare the message.

Mr. Choate on Monday brought out that in May, 1908, E. H. Harriman, who then had an interest in the Delaware & Hudson

and the Erie, made Mr. Mellen an offer to buy the New Haven's interest in the Boston & Maine. Mr. Mellen at first was willing to consider the offer, particularly as at the time there was much popular opposition to the New Haven's control of the road. According to this testimony on Monday, however, he did not really want to sell the Boston & Maine, but it did occur to him that if the New Haven was not able to get from the Massachusetts legislature the legislation it required, it might find Mr. Harriman a convenient purchaser. The negotiations lasted until May, 1909, the New Haven finally declining to sell because it secured the necessary legislation.

Mr. Mellen took occasion to say at this point that if the Boston & Maine had ever fallen under the domination of Mr. Harriman, New England would have found that there are harder railroads to deal with than the New Haven. "There would have been no more independence of the trunk roads for New England if the Harriman system had managed to acquire the Boston & Maine. It would have become impossible for the New Haven to maintain its independence. New England would have come under the trunk lines."

Mr. Mellen was finally excused as a witness on Tuesday, having completed 36 days on the stand.

Wednesday, Samuel Hemingway, president of the Second National Bank of New Haven, through which institution was handled the financing of the New England Investment & Securities Company, was on the stand. He was followed by L. H. Fitzhugh, vice-president of the Grand Trunk at New London, and by Thomas B. McGovern, a shipping broker, who testified concerning the acquisition of the Metropolitan Steamship Co.

Operating Revenues and Expenses of Express Companies for August, 1915

The following statement, which is subject to revision, has been compiled by the Interstate Commerce Commission from the monthly reports of operating revenues and expenses of the principal express companies for August, 1915.

A Record Snowstorm

A snowstorm which prevailed on the Atlantic Coast from Philadelphia northward to Boston and beyond, on Monday and Tuesday of this week, caused serious delay to passenger traffic on all of the roads in that territory; and on the New York, New Haven & Hartford between New Haven and its New York City terminus electric traffic was entirely suspended for two days, the electric power line having been disabled; and the telegraph, telephone and signaling wires were broken down by the weight of snow and ice in many places. This four-track line, running 18 express trains to Boston daily, and about 70 passenger trains altogether, to and from New York, suffered an interruption more serious, probably, than any since the time of the notable storm of March, 1888 (when the traffic was much smaller in volume than now).

The storm began with rain; by Monday noon it began to snow and the snow and rain combined froze to wires and posts, the coating being three inches thick, and more, on nearly all wires. On Tuesday morning the storm had abated and the depth of snow on the ground was about 12 inches.

The New Haven road, using steam locomotives, ran about one-tenth the usual number of passenger trains on Tuesday, and not many more on Wednesday, all movements being much behind time. The block signals were out of service all the way from New Haven to the connection with the New York Central at Woodlawn, about 60 miles, and trains had to be run by time interval or with speed under control. Freight trains had been moved clear of the main track early on Tuesday at nearly all points west of New Haven.

By Wednesday evening the block signals had been restored between Woodlawn and Stamford, 20 miles, and electric motive power was available to a limited extent; but the passenger service was very deficient on Thursday.

On roads other than the New Haven, the delays were due mainly to the snow, and were serious on all lines except the Pennsylvania. At Poughkeepsie, on the New York Central, 75 miles north of New York, and at Albany, 70 miles farther

A. FOR THE MONTH OF AUGUST.

	1915 Adams Express Co.	1914 American Express Co.	1915 Canadian Express Co.	1914 Globe Express Co.	1915 Great Northern Express Co.	1914 Northern Express Co.	1915 Southern Express Co.	1914 Wells Fargo & Co.	1915 Western Express Co.	1914 Total for Companies Named
Mileage of all lines covered (miles).....	44,930.22	44,781.78	74,260.80	73,537.65	10,238.13	9,676.50	2,839.78	9,582.80	9,568.79	
Charges for transportation.....	\$3,041,197	\$2,753,255	\$4,207,623	\$3,775,365	\$325,941	\$291,320	\$302	\$78,447	\$326,408	\$320,570
Express privileges-Dr.....	1,498,955	1,481,109	2,106,437	1,897,026	170,060	147,683	44	39,185	197,723	194,098
Operations other than transportation.....	45,793	49,317	248,645	174,185	5,370	5,494	9	803	5,066	4,871
Total operating revenues.....	1,588,035	1,321,464	2,349,831	2,052,524	161,250	149,131	266	40,065	133,752	131,343
Operating expenses.....	1,445,440	1,494,028	2,136,784	2,167,776	133,942	140,064	1,036	31,260	89,940	93,477
Net operating revenue.....	142,595	172,564	213,046	115,251	27,307	9,066	769	8,805	43,811	37,866
Uncollectible revenue from transp.....	571	658	365	91	13	.....	.....	.....	48	.....
Express taxes.....	17,012	17,671	35,422	38,430	4,200	4,000	700	1,100	4,221	4,678
Operating income.....	125,010	190,895	177,258	153,773	23,094	5,066	1,469	7,705	39,541	33,188
	Total for Companies Named									
Mileage of all lines covered (miles).....	8,233.03	8,118.34	34,728.60	34,703.60	114,622.94	112,185.02	5,252.87	5,174.26	301,829.39	300,585.72
Charges for transportation.....	\$301,913	\$273,161	\$977,176	\$968,669	\$3,355,619	\$3,130,989	\$124,655	\$99,765	\$12,660,838	\$11,691,546
Express for transportation.....	162,260	144,433	498,225	494,565	1,733,318	1,613,524	57,815	53,993	6,424,842	6,065,621
Operation other than transportation.....	3,999	3,398	22,617	22,890	90,228	58,254	3,200	2,737	424,930	321,956
Total operating revenues.....	143,651	132,127	501,568	496,994	1,712,529	1,575,720	70,039	48,509	6,660,926	5,947,881
Operating expenses.....	92,260	93,001	485,440	614,410	1,556,328	1,506,358	53,840	53,269	5,995,016	6,093,649
Net operating revenue.....	51,391	39,125	16,127	17,416	156,201	69,361	16,198	4,760	655,910	143,768
Uncollectible revenue from transp.....	16	21	46	.....	1,307	672	.....	9	2,370	1,454
Express taxes.....	5,000	5,000	12,943	14,803	34,944	37,302	930	1,126	115,375	124,113
Operating income.....	46,375	34,103	3,137	32,219	119,949	31,386	15,268	5,896	548,165	271,335

B. FOR THE TWO MONTHS ENDING WITH AUGUST.

	1915 Adams Express Co.	1914 American Express Co.	1915 Canadian Express Co.	1914 Globe Express Co.	1915 Great Northern Express Co.	1914 Northern Express Co.	1915 Southern Express Co.	1914 Wells Fargo & Co.	1915 Western Express Co.	1914 Total for Companies Named
Charges for transportation.....	\$6,140,316	\$5,653,778	\$8,554,163	\$7,834,639	\$633,515	\$610,078	\$1,119	\$153,210	\$640,257	\$663,776
Express privileges-Dr.....	3,031,609	2,860,260	4,293,436	3,903,846	327,162	310,850	436	76,559	387,499	401,905
Operations other than transportation.....	93,709	90,677	460,406	356,372	10,632	10,636	10	1,601	10,026	9,818
Total operating revenues.....	3,202,417	2,884,195	4,721,132	4,287,165	316,966	309,864	692	78,251	262,785	271,688
Operating expenses.....	2,895,032	3,036,327	4,218,756	4,424,900	270,763	282,815	2,358	61,158	181,162	262,227
Net operating revenue.....	307,384	152,132	502,375	137,735	46,202	27,049	1,665	17,093	81,623	85,458
Uncollectible revenue from transp.....	852	713	1,002	110	13	.....	.....	.....	68	.....
Express taxes.....	32,613	35,002	70,845	74,054	8,400	8,000	1,400	2,200	8,505	8,859
Operating income.....	273,918	187,848	430,527	211,900	37,789	19,049	3,065	14,893	73,050	76,600
	Total for Companies Named									
Charges for transportation.....	\$630,821	\$600,961	\$2,030,672	\$2,142,749	\$6,833,082	\$6,384,455	\$246,921	\$207,600	\$25,710,870	\$24,251,246
Express privileges-Dr.....	337,265	318,405	1,035,849	1,093,318	3,539,612	3,282,573	114,007	111,683	13,066,899	12,359,404
Operations other than transp.....	7,726	6,601	44,721	46,370	182,862	120,059	6,627	5,680	816,725	647,818
Total operating revenues.....	301,283	289,156	1,039,545	1,095,801	3,476,331	3,221,940	139,540	101,596	13,460,696	12,539,660
Operating expenses.....	186,559	193,547	984,050	1,050,126	3,132,594	3,025,925	109,809	109,021	11,981,088	12,370,050
Net operating revenue.....	114,723	95,609	55,494	45,675	343,737	196,015	29,730	7,424	1,479,608	169,610
Uncollectible revenue from transp.....	49	30	117	.....	2,189	716	12	25	4,305	1,596
Express taxes.....	10,000	10,000	26,736	29,589	69,655	74,847	1,855	2,255	230,012	244,809
Operating income.....	104,674	85,579	28,641	16,085	271,892	120,452	27,862	9,705	1,245,291	76,795

1. Discontinued operations on April 30, 1915.

north, the depth of snow was 24 inches. Passenger trains were many hours late and freight trains were not moved.

The milk dealers of New York City, receiving milk on all of the roads entering the city, reported on Tuesday evening that they had been able to deliver only about one-half the usual quantities of milk on that day.

At Philadelphia the depth of snow was about 7 inches. All roads suffered moderate delays.

Railway Earnings for September Break Record

Operating revenues, net operating revenues and net operating income per mile of the railways of the United States having annual operating revenues above \$1,000,000 were all greater than for any September in their history, according to the figures shown in the monthly bulletin issued by the Bureau of Railway Economics.

As shown by the Bureau of Railway Economics, the net operating income for September increased \$73 per mile, or 20.9 per cent, as compared with September, 1914. However, September, 1914, largely because of conditions in the South, was the lowest September in the last six years. A comparison of September, 1915, with the average September of the preceding five years, shows an increase of 17.4 per cent.

Total operating revenues amounted to \$286,403,834, an increase from 1914 of \$16,842,784. Operating expenses were \$177,140,771, a decrease of \$814,846. Net operating revenue amounted to \$109,263,063, an increase of \$17,657,630. Taxes amounted to \$11,783,145, an increase of \$336,003. This left \$97,412,193 of net operating income, available for rentals, interest on bonds, appropriations for improvements and new construction and dividends. Operating revenues per mile of line averaged \$1,251, an increase of 5.6 per cent; operating expenses averaged \$774, a decrease of 1.1 per cent; net operating revenue per mile averaged \$477, an increase of 18.6 per cent, while net operating income per mile was \$426, an increase of 20.9 per cent. Taxes per mile increased 2.3 per cent. Railways operating 228,775 miles of line are covered by this summary, or about 90 per cent of the steam railway mileage in the United States.

Operating revenues of the Eastern railways per mile show an increase of 7.9 per cent as compared with September, 1914, operating expenses decreased 0.7 per cent, net operating revenue increased 26.1 per cent, taxes decreased 1.6 per cent and operating income increased 29.9 per cent.

Operating revenues of the Southern railways per mile increased 7.8 per cent, operating expenses decreased 3.5 per cent, net operating revenue increased 41.0 per cent, taxes increased 6.4 per cent and operating income increased 48.0 per cent. But September, 1914, was far below the average. Compared with the average September of the preceding five years, the operating income for the month of September, 1915, increased 21.6 per cent.

Operating revenues of the Western railways per mile show an increase of 2.8 per cent, operating expenses decreased 0.2 per cent, net operating revenue increased 7.7 per cent, taxes increased 4.8 per cent and operating income increased 8.0 per cent.

The three months of the current fiscal year show an increase in total operating revenues per mile of line of 2.4 per cent, as compared with the corresponding period of the preceding year, a decrease in operating expenses per mile of 2.9 per cent, an increase in net operating revenue per mile of 13.6 per cent, an increase in taxes per mile of 1.9 per cent and an increase in operating income per mile of 15.4 per cent.

Operating income per mile increased 24.3 per cent in the East, increased 25.7 per cent in the South, and increased 5.0 per cent in the West.

September operating income per mile was 20.9 per cent greater in 1915 than in 1914, 19.6 per cent greater than in 1913, 9.9 per cent greater than in 1912 and 15.9 per cent greater than in the year 1911.

The American Society of Mechanical Engineers

The following is the list of the newly elected officers of the American Society of Mechanical Engineers for the coming year: D. S. Jacobus, president; W. B. Jackson, J. Sellers Bancroft and Julian Kennedy, vice-presidents; J. H. Barr, J. A. Stevens and H. deB. Parsons, managers, and W. H. Wiley, treasurer.

REVENUES AND EXPENSES OF STEAM ROADS—SEPTEMBER, 1915												
Compiled from monthly returns of the railways to the Interstate Commerce Commission and covering roads of Class I, i. e., roads with annual operating revenues above \$1,000,000.												
ACCOUNT	UNITED STATES			EASTERN DISTRICT			SOUTHERN DISTRICT			WESTERN DISTRICT		
	Amount September, 1915	1915	1914	Amount September, 1915	1915	1914	Amount September, 1915	1915	1914	Amount September, 1915	1915	1914
	Per mile of line	Increase over per cent	Per mile of line	Increase over per cent	Per mile of line	Increase over per cent	Per mile of line	Increase over per cent	Per mile of line	Amount September, 1915	1915	1914
Total Operating Revenue.....	\$1,251	5.6	\$2,022	7.9	\$930	7.8	\$862	7.8	\$904	\$118,756,455	\$929	\$904
Freight	867	6.5	1,364	10.0	690	11.9	616	11.9	624	81,002,906	634	624
Passenger	272	2.1	463	0.8	176	d 4.1	184	d 4.1	213	27,297,916	213	202
Mail	22	4.8	32	9.5	15	1.8	15	1.8	20	2,566,669	20	24
Express	28	10.9	45	15.6	20	3.3	19	3.3	20	2,603,535	20	19
All other	62	6.7	121	8.7	29	28	28	28	42	5,285,429	42	39
Total Operating Expenses.....	774	d 1.1	1,373	d 0.7	621	d 3.5	643	d 3.5	553	70,706,810	553	555
Maint. of way and struct....	154	1.7	240	2.9	126	d 2.3	129	d 2.3	119	15,230,176	119	117
Maint. of equipment.....	192	d 0.2	349	1.0	169	d 2.4	173	d 2.4	127	16,234,413	127	128
Traffic	21	1.0	31	...	21	d 8.1	22	d 8.1	18	2,226,006	18	16
Transportation	373	d 3.0	694	d 2.8	278	d 5.1	293	d 5.1	271	33,911,320	265	271
General	27	1.5	44	1.9	24	d 1.0	24	d 1.0	20	2,588,161	20	20
All other	7	8.1	15	d 4.7	3	102.2	2	102.2	3	516,734	4	3
Net Operating Revenue.....	477	18.6	649	26.1	309	41.0	219	41.0	349	48,049,645	376	349
Taxes	51	2.3	80	d 1.6	39	6.4	37	6.4	41	5,513,981	43	41
Uncollectible Revenues	*	...	*	...	*	...	*	...	*	32,320	*	*
Operating Income	426	20.9	569	29.9	270	48.0	182	48.0	308	42,503,344	333	308
Operating ratio—Per cent....	{ 1915		62.5		66.7		66.7		59.5			
	{ 1914		67.9		74.6		74.6		61.4			
Average mileage represented...	{ 1915		58,800		42,094		42,094		127,791			
	{ 1914		58,813		41,942		41,942		126,653			

* Less than one dollar. a Less than one-tenth of one per cent. d Decrease.

The Railway Club of Pittsburgh

At the regular meeting of the Railway Club of Pittsburgh, to be held on Tuesday, December 21, at the Monongahela House, Pittsburgh, Pa., Samuel Lynn, master car builder of the Pittsburgh & Lake Erie will present a paper on "The Life of the Steel Freight Car."

MEETINGS AND CONVENTIONS

The following list gives names of secretaries, date of next or regular meetings, and places of meeting of those associations which will meet during the next three months. The full list of meetings and conventions is published only in the first issue of the Railway Age Gazette for each month.

- AMERICAN ASSOCIATION OF DEMURRAGE OFFICERS.**—F. A. Pontious, 455 Grand Central Station, Chicago. Next meeting, January, 1916, Atlanta, Ga.
- AMERICAN SOCIETY OF CIVIL ENGINEERS.**—Chas. Warren Hunt, 220 W. 57th St., New York. Regular meetings, 1st and 3d Wednesday in month, except July and August, 220 W. 57th St., New York.
- AMERICAN WOOD PRESERVERS' ASSOCIATION.**—F. J. Angier, Supt. Timber Preservation, B. & O., Mt. Royal Sta., Baltimore, Md. Next convention, January 18-20, 1916, Chicago.
- CANADIAN RAILWAY CLUB.**—James Powell, Grand Trunk, P. O. Box 7, St. Lambert (near Montreal), Que. Regular meetings, 2d Tuesday in month, except June, July and August, Windsor Hotel, Montreal, Que.
- CANADIAN SOCIETY OF CIVIL ENGINEERS.**—Clement H. McLeod, 176 Mansfield St., Montreal, Que. Regular meetings, 1st Thursday in October, November, December, February, March and April. Annual meeting, January, Montreal.
- CAR FOREMEN'S ASSOCIATION OF CHICAGO.**—Aaron Kline, 841 Lawlor Ave., Chicago. Regular meetings, 2d Monday in month, except June, July and August, Hotel La Salle, Chicago.
- CENTRAL RAILWAY CLUB.**—H. D. Vought, 95 Liberty St., New York. Regular meetings, 2d Friday in January, May, September and November. Annual meeting, 2d Thursday in March, Hotel Statler, Buffalo, N. Y.
- ENGINEERS' SOCIETY OF WESTERN PENNSYLVANIA.**—Elmer K. Hiles, 2511 Oliver Bldg., Pittsburgh, Pa. Regular meetings, 1st and 3d Tuesday, Pittsburgh, Pa.
- GENERAL SUPERINTENDENTS' ASSOCIATION OF CHICAGO.**—A. M. Hunter, 321 Grand Central Station, Chicago. Regular meetings, Wednesday, preceding 3d Thursday in month, Room 1856, Transportation Bldg., Chicago.
- NEW ENGLAND RAILROAD CLUB.**—W. E. Cade, Jr., 683 Atlantic Ave., Boston, Mass. Regular meeting, 2d Tuesday in month, except June, July, August and September, Boston.
- NEW YORK RAILROAD CLUB.**—Harry D. Vought, 95 Liberty St., New York. Regular meeting, 3d Friday in month, except June, July and August, 29 W. 39th St., New York.
- NIAGARA FRONTIER CAR MEN'S ASSOCIATION.**—E. N. Frankenberger, 623 Brisbane Bldg., Buffalo, N. Y. Meetings, 3d Wednesday in month, New York Telephone Bldg., Buffalo, N. Y.
- PEORIA ASSOCIATION OF RAILROAD OFFICERS.**—M. W. Rotchford, 410 Masonic Temple Bldg., Peoria, Ill. Regular meetings, 3d Thursday in month, Jefferson Hotel, Peoria.
- RAILROAD CLUB OF KANSAS CITY.**—Claude Manlove, 1008 Walnut St., Kansas City, Mo. Regular meetings, 3d Saturday in month, Kansas City.
- RAILROAD MEN'S IMPROVEMENT SOCIETY.**—J. B. Curran, Erie R. R., 50 Church St., New York. Meetings, alternate Thursdays, October to May, Assembly Rooms of Trunk Line Association, 143 Liberty St., New York.
- RAILWAY BUSINESS ASSOCIATION.**—Frank W. Naxon, 30 Church St., New York. Annual meeting, January, 1916, Waldorf-Astoria Hotel, New York.
- RAILWAY CLUB OF PITTSBURGH.**—J. B. Anderson, Room 207, P. R. R. Sta., Pittsburgh, Pa. Regular meetings, 4th Friday in month, except June, July and August, Monongahela House, Pittsburgh.
- RICHMOND RAILROAD CLUB.**—F. O. Robinson, C. & O., Richmond, Va. Regular meetings, 2d Monday in month, except June, July and August.
- ST. LOUIS RAILWAY CLUB.**—B. W. Frauenthal, Union Station, St. Louis, Mo. Regular meetings, 2d Friday in month, except June, July and August, St. Louis.
- SALT LAKE TRANSPORTATION CLUB.**—R. E. Rowland, David Keith Bldg., Salt Lake City, Utah. Regular meetings, 1st Saturday of each month, Salt Lake City.
- SOUTHERN & SOUTHWESTERN RAILWAY CLUB.**—A. J. Merrill, Grant Bldg., Atlanta, Ga. Regular meetings, 3d Thursday, January, March, May, July, September, November, 10 A. M., Piedmont Hotel, Atlanta.
- TOLEDO TRANSPORTATION CLUB.**—Harry S. Fox, Toledo, Ohio. Regular meetings, 1st Saturday in month, Boody House, Toledo.
- TRAFFIC CLUB OF NEWARK.**—Roy S. Bushy, Firemen's Bldg., Newark, N. J. Regular meetings, 1st Monday in month, except July and August, The Washington, 559 Broad St., Newark.
- TRAFFIC CLUB OF NEW YORK.**—C. A. Swope, 291 Broadway, New York. Regular meetings, last Tuesday in month, except June, July and August, Waldorf-Astoria Hotel, New York.
- TRAFFIC CLUB OF PITTSBURGH.**—D. L. Wells, Gen'l Agt., Erie R. R., 1924 Oliver Bldg., Pittsburgh, Pa. Meetings, bi-monthly, Pittsburgh.
- TRAFFIC CLUB OF ST. LOUIS.**—A. F. Versen, Mercantile Library Bldg., St. Louis, Mo. Annual meeting in November. Noonday meetings, October to May.
- TRANSPORTATION CLUB OF DETROIT.**—W. R. Hurley, Superintendent's office, N. Y. C. R. R., Detroit, Mich. Meetings monthly, Normandie Hotel, Detroit.
- UTAH SOCIETY OF ENGINEERS.**—Frank W. Moore, 1111 Newhouse Bldg., Salt Lake City, Utah. Regular meetings, 3d Friday in month, except July and August, Salt Lake City.
- WESTERN CANADA RAILWAY CLUB.**—L. Kon, Immigration Agent, Grand Trunk Pacific, Winnipeg, Man. Regular meetings, 2d Monday, except June, July and August, Winnipeg.
- WESTERN RAILWAY CLUB.**—J. W. Taylor, 1112 Karpen Building, Chicago. Regular meetings, 3d Tuesday in month, except June, July and August, Karpen Bldg., Chicago.
- WESTERN SOCIETY OF ENGINEERS.**—E. N. Layfield, 1735 Monadnock Block, Chicago. Regular meetings, 1st Monday in month, except January, July and August, Chicago. Extra meetings, except in July and August, generally on other Monday evenings. Annual meeting, 1st Wednesday after 1st Thursday in January, Chicago.

Traffic News

The Union Pacific has requested shippers routing freight through Seattle for export to arrange for steamer space before shipping.

From April 1, 1914, to November 16, 1915, the daily Oriental Limited express train of the Great Northern in 593 consecutive westbound summer and winter runs arrived at Seattle on time 561 days.

The Chicago & Alton freight department announces a through package car from Chicago to Shreveport, La., in connection with the Kansas City Southern via Kansas City, giving fourth morning delivery from Chicago.

The express companies have made arrangements to keep their Chicago offices open for the receipt of packages until 9:00 o'clock every evening and their depot stations all night, during the month of December, for the purpose of preventing congestion.

Figures compiled by the American Railway Association's committee on relations between railroads show that the total freight car surplus on December 1 was 60,793, as against 55,793 on November 1. The total shortage on December 1 was 22,594, and on November 1, 27,525.

The Official Classification Committee, which has recently been reorganized with four permanent members, has issued an announcement of the plan under which it will operate for the present. Requests for changes in the classification must be filed in writing with the committee. Dockets for subjects involving changes to be considered at regular meetings will be issued with reasonable advance notice and will be mailed to subscribers at a charge of \$1 per year. The committee will hear those interested in docketed subjects at meetings in Chicago and New York in January, March, May, July, September and November, as announced in the docket. Conference with the committee may be had by appointment respecting subjects not on the docket.

Additional Embargoes at New York

C. C. McCain, chairman of the Trunk Line Association, announced this week that the number of cars of freight waiting at New York to be unloaded, including those on the way, east of Buffalo and Pittsburgh, was about 45,000, or approximately 3,500 more than one week before; and that with all facilities fully engaged, including all lighters and car floats, not over 1,500 cars can be delivered daily.

The Pennsylvania Railroad, on Tuesday, put embargoes on all carload and L. C. L. freight from points off its own lines, when consigned to New York to be lightered, except perishable freight, flour and other foodstuffs for local consumption; excepting also coal for delivery at Jersey City, coal to supply railroad with fuel, and coal for public service corporations. Through freight for New England over the New York, New Haven & Hartford is not covered by the embargo. The statement says that the congestion at New York has been largely due to mills and factories shipping their products without regard to facilities for unloading. On freight not embargoed, the company will try to induce shippers to send out only such freight as can be promptly unloaded. A separate embargo includes Newark, N. J., and Waverly, the freight transfer station west of New York and all shipments going through Waverly except for the New Haven road.

The New York Central has embargoed all flour and grain products for export through New York; also lumber and hay to be lightered.

The Erie has embargoed flour for export, not only that on through bills of lading, but all other.

The Baltimore & Ohio has embargoed lumber from the South, destined to New York for export.

The Central of New Jersey has embargoed all freight for delivery to coastwise steamers at New York; all freight for delivery at New York to go to the Pacific Coast by steamer; and all freight to be delivered at Brooklyn terminals. The Baltimore & Ohio has embargoed all grain for export via Baltimore, about 4,000 carloads being now held for the elevators at that port.

Commission and Court News

INTERSTATE COMMERCE COMMISSION

Pipe Line Transportation of Petroleum

In re conditions affecting the production, transportation and marketing of crude petroleum. Opinion by the commission:

In accordance with a resolution by the United States Senate adopted in September, 1914, the commission made an investigation of the control of pipe line companies and a discontinuance of running and purchase of petroleum in 1914 and the reasons therefor. It was found that certain pipe line companies had directors and officers common with other pipe line companies. The Federal Trade Commission is making an investigation of the oil industry, and the Interstate Commerce Commission, not having jurisdiction to investigate the records of industrial concerns, leaves the subject of what disposition the purchasing agencies have made of crude oil purchased and to whom it has been turned over for refining and manufacture, in so far as such information cannot be obtained from the pipe line companies' records, to appear in the reports of the Federal Trade Commission.

As to the discontinuance of running and purchase of petroleum in 1914, the commission puts on record the letters from pipe line officers to their subordinates showing that this was done because of the conditions in the crude petroleum market caused by the war and in order to guard against having storage tanks full to capacity with no assurance of being able to get rid of the stored oil. (36 I. C. C., 429.)

Rates on Lumber to Points in Texas

Oklahoma Traffic Association et al. v. Abilene & Southern et al. Opinion by Commissioner Daniels:

The commission finds that the carriers have not justified a proposed cancellation of the application of rates on lumber to sash, doors and blinds, in carloads, from Oklahoma City and Okmulgee and other points in Oklahoma, and from Shreveport and other points in Louisiana, to points in Texas, and proposed carload rates on sash, doors and blinds from Oklahoma City and other points in Oklahoma to certain points in Texas.

The present rates on sash, doors and blinds and other wooden building materials rated with sash, doors and blinds, in carloads, from Oklahoma City and Okmulgee to points in Texas are found unreasonable and reasonable rates are prescribed for the future.

The maintenance of narrower descriptions of building materials, higher minimum carload weights and less extensive schemes of joint rates from Oklahoma City and Okmulgee, Okla., to points in Texas than from Kansas City and St. Louis, Mo., Waco, Tex., and other competing points, is held to be discriminatory.

The present relationship between rates on wooden building materials, in carloads, from Oklahoma City and Okmulgee, Okla., to Texas, and from Texas producing points to the same points is also held discriminatory.

Fourth section relief is denied. (36 I. C. C., 329.)

Eastern Live-Stock Case

Opinion by Commissioner Meyer:

In tariffs filed to become effective March 15, 1915, and later dates, suspended by the commission to January 13, 1916, the carriers proposed changes as follows:

First, a general revision of rates on live-stock, except horses and mules, between points in central freight association territory, with certain increases in carload minimum weights. A related revision of rates on fresh meat and packing house products has been made the subject of an investigation: Central Freight Association Territory Fresh Meat and Packing-House Product Rates.

Second, increased rates on live stock, except horses and mules, on fresh meat and on packing-house products, packed and loose, from points in central freight association territory to points in

trunk line and New England freight association territories, with certain increases in carload minimum weights.

The rates here sought to be increased were increased 5 per cent at the time of the decision in the Five Per Cent Case. (31 I. C. C., 351; 32 I. C. C., 325.)

The commission's findings are as follows: The carriers may establish new rates on live stock, except horses and mules, in central freight association territory higher than those at present in effect, but the increases are not as great as those proposed by the carriers. Certain of the increased carload minimum weights are also allowed. In connection with these live-stock the carriers introduced evidence intended to show that the transportation of live stock is more expensive than the transportation of other kinds of freight, because (a) the number of tons of equipment hauled per ton of live stock is greater than that for other freight; (b) greater engine energy is required to haul live stock with consequent greater cost; (c) the car efficiency of live-stock cars is less than that of other equipment; (d) terminal facilities for live stock are more expensive; (e) live stock is peculiarly subject to state and federal regulations, compliance with which directly involves additional operating expenses; (f) the expedited service afforded live stock is more expensive than slow freight service; (g) the free transportation of attendants is a source of expense peculiar to live stock; (h) the terminal expense of handling live stock is high; (i) the cost of cleaning and disinfecting stock cars and pens is high; (j) the road movement for short hauls of live stock is particularly expensive; (k) quarantine regulations applying to live stock are burdensome; (l) delay to other trains is caused by live stock, both on the road and at terminal points; (m) the live-stock movement entails special work connected with dispatching.

The commission also finds that the carriers have justified the following: Proposed increased rates on cattle and on hogs and sheep or goats in single-deck and in double-deck cars from points in central freight association territory to points in trunk line and New England freight association territories; certain proposed increased carload minima applicable to live stock shipped between the same points, certain other proposed changes not being allowed; proposed increased rates on fresh meat from points in central freight association territory to points in trunk line and New England freight association territories; and proposed increased carload minima applicable to fresh meat and packing-house products, loose, from points in central freight association territory to points in trunk line and New England freight association territories.

It is found that the carriers have not justified increased rates on packing-house products, packed, and packing-house products, loose, from points in central freight association territory to points in trunk line and New England freight association territories, which would exceed the classification rates on these commodities, nor have they justified proposed increased rates and carload minima applying on live stock and packing-house products between points in trunk line territory east of the western termini of the trunk lines. (36 I. C. C., 675.)

STATE COMMISSIONS

The Tennessee Railroad Commission has suspended new tariffs recently filed by the railroads in Nashville increasing rates for switching cars in that city.

The Illinois Public Utilities Commission has ordered a hearing on January 4 on tariffs filed by the railways imposing a charge for cleaning and disinfecting stock cars.

The New York State Public Service Commission, First district, has postponed to February 1, 1916, the time within which the Interborough Rapid Transit Company must install and experiment with automatic block signals on the elevated lines of the company, where speeds are always low; and the road is required to report the results of its test by August 1, 1916.

The Railroad Commission of New Hampshire, at Concord, December 8, continued its investigation into the acts of the Boston & Maine, in 1912, when the Grand Trunk was threatening to build a line southeastward through New Hampshire to Boston. Testimony was presented to the effect that the total expenditures of the Boston & Maine, and its subsidiary line, the Concord & Montreal, to thwart the Grand Trunk, were \$78,565.

PERSONNEL OF COMMISSIONS

Hon. Oscar S. Straus, of New York City, formerly secretary of commerce and labor, and later ambassador to Turkey, has been appointed by the governor to the position of chairman of the New York Public Service Commission, First district, in place of E. E. McCall, removed by the governor last week.

Hon. Francis M. Cockrell, formerly a member of the Interstate Commerce Commission, died at his home in Washington, December 13, at the age of 81. Mr. Cockrell was an officer in the Confederate army, rising to the grade of brigadier general; and after the war was for 30 years United States senator from Missouri.

COURT NEWS

The United States court at San Francisco has issued an injunction restraining the Interstate Commerce Commission from enforcing that part of its order of April 30, on west-bound transcontinental freight rates, which removes the cities of Sacramento, Stockton, San Jose and Santa Clara from the list of cities taking terminal rates. The order became effective on July 14, and a temporary injunction at that time was denied by the court.

The Pennsylvania Company, and the Pittsburgh, Cincinnati, Chicago & St. Louis pleaded guilty in the United States Court at Chicago last week to indictments charging them with having allowed rebates by refunding \$2 a carload on shipments of grain from the B. A. Eckhart Milling Company, Chicago, to eastern points during 1912 and 1913. Counsel for the roads contended that the payments were lawful as representing switching charges which had previously been paid by the shippers on the grain, inbound. Judge Landis found the roads guilty under two indictments of five counts each, while permission was granted to present further evidence, that the court may determine the degree of guilt and fix the penalty.

Written Notice of Damage Provision Must Be Pleaded

The Nebraska Supreme Court holds that the provisions of a bill of lading requiring written notice of damage to be given to the carrier and fixing a time less than that fixed by the statute in which action shall be commenced, in order to be available as a defense, must be pleaded as such; otherwise they are deemed waived.—*Gilinsky v. Illinois Central* (Neb.), 154 N. W. 730.

Assessment of Uncompleted Right of Way

The West Virginia Supreme Court of Appeals holds that a county assessor has no authority to assess any part of a public railroad company's right of way, not so far completed as to be fit for use, unless and until the land acquired therefor has been transferred to it from the former owner on the land books; and such assessment by him is unlawful and void.—*Clarksburg Northern v. Morris* (W. Va.), 86 S. E. 893.

Hours of Service Act—Operator in Emergency Service

The federal District Court, Northern district of West Virginia, holds that the words "towers, offices, places and stations" in the provision in the hours of service act as to telegraph operators refer to telegraph offices generally; and that operators engaged in wrecking or relief service, though technically not members of "the crews of wrecking and relief trains" expressly excepted from the provision of the act, are engaged in emergency work, and are therefore excepted.—*United States v. Baltimore & Ohio*, 226 Fed. 220.

White and Negro Accommodations—Intrastate Trains Only

The Louisiana Supreme Court having held that the Louisiana statute requiring separate accommodations for white and negro passengers applies to intrastate passengers only, the Mississippi Supreme Court holds, in an action by a passenger on an interstate train for being forcibly deprived of his seat in a comfortable car to accommodate a negro excursion, and to ride in the caboose, that the giving an instruction on the statute in such an action was error.—*O'Leary v. Illinois Central* (Miss.) 69 So. 713.

Killing Animals—No Presumption of Negligence

Action was brought for the loss of a mule which had strayed upon a public crossing in the night time and was first seen by the enginemen when it was utterly impossible to avoid striking the animal. The Oklahoma Supreme Court reversed a judgment for the plaintiff. The plaintiff's right of recovery depends on the defendant's negligence, and there was no circumstance from which negligence might be reasonably inferred; so it is the duty of the court to direct a verdict for the defendant.—*Ft. Smith & Western v. Dixon* (Okla.), 152 Pac. 350.

Penalty Under Hours of Service Act

The federal District Court, Northern district of West Virginia, holds that a railroad company which permits telegraph operators to work a greater number of hours than is prescribed by the hours of service act, and fails to make report of the extra hours of service rendered, is liable to but one penalty for each employee, and not for a further sum per day for each of the days the reports have been in default, where it denied liability, and where the omission was made in good faith, and under the belief that such report was not required.—*United States v. B. & O.*, 226 Fed. 220.

Liability of Intermediate Carrier for Delay

Prior to the existence of the Carmack amendment the different state courts by their decisions had adopted different rules relative to actions for damages by shippers against railroads. The purpose of the amendment was to secure simplicity in the transportation of freight carried by several railroads by localizing the responsible carrier. The Federal District Court, D. Minnesota, holds that under the amendment an intermediate carrier cannot be sued for delay in transportation of an interstate shipment of live stock where the delay was not caused by its line, regardless of whether or not it had issued a bill of lading.—*Hudson v. Chicago, St. P. M. & O.*, 226 Fed. 38.

Powers of Railroad Commission

The Louisiana Supreme Court holds that neither the Constitution nor any statute, either directly or by fair implication, confers on the Railroad Commission of Louisiana jurisdiction to assess or award against a railroad company, damages alleged to have been sustained by a shipper or consignee by reason of its observance of a freight rate authorized by the commission, but subsequently declared to be unreasonable. Whether such damages are recoverable in an ordinary action in a court is a question which was not involved in the case.—*Texas & Pacific v. Railroad Commission* (La.), 69 So. 837.

Abandonment of Highway in Railroad's Possession

A railroad company agreed with highway commissioners of a town that it would dedicate a new road and pay \$300, which was done, in return for the abandonment of an old road on land where the railroad desired to excavate. For years no public right was exercised in the old road, but it was held (adversely to such rights) by the railroad, and with the acquiescence of the public. The highway commissioners then sought to compel the railroad to construct crossings and approaches over its tracks for the old road. The Illinois Supreme Court held that the public was bound by the doctrine of equitable estoppel, and the old road must be regarded as abandoned.—*People v. C. C. C. & St. L.* (Ill.), 109 N. E. 1064.

Yard Accident—Assumption of Risk

A fireman was required to check in on return from each trip. Incoming engines were stopped over a cinder pit. Beside the track was an ash pit which had never been lighted. One night the fireman's engine stopped short of the cinder pit, another engine being over it. He started to the roundhouse to check in and fell into the ash pit. He had always known of the location of the ash pit and that it was never lighted, and he admitted that he knew he might fall into the pit by going the way he did. The Utah Supreme Court held that he could not recover against the railroad, since he assumed that hazard of his employment, regardless of whether the danger was ordinarily incident to it.—*Laub v. San Pedro, L. A. & S. L.* (Utah), 152 Pac. 467.

Railway Officers

Executive, Financial, Legal and Accounting

R. E. Berger, auditor of freight accounts for the Wabash, has been promoted to assistant auditor. S. J. Parks, auditor of passenger accounts, has been appointed auditor of freight accounts. P. E. Purcell has been appointed auditor of disbursements and J. H. Rueger, auditor of passenger accounts. They will all have headquarters at St. Louis, Mo.

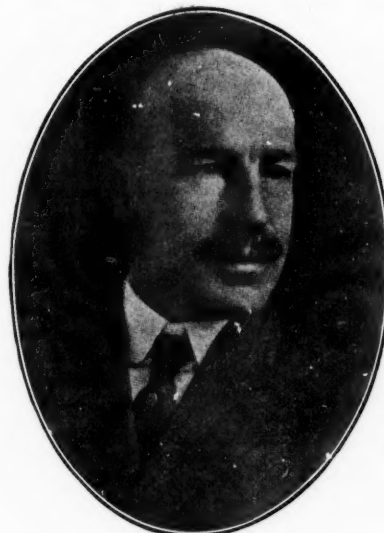
John D. Caldwell, whose election as secretary of the Chicago, St. Paul, Minneapolis & Omaha has been announced in these columns, was born on July 4, 1863, at Lynn, Mass. He received



J. D. Caldwell

a common school education and entered railway service in 1880, as a telegraph operator for the Delaware & Chesapeake. Later he became a clerk in the motive power department of the Northern Central and the Baltimore & Potomac, and in 1884, went to the Denver & Rio Grande as a telegraph operator, and subsequently as secretary to the superintendent of motive power. He entered the service of the Chicago & North Western on July 20, 1885, as secretary to the president, and remained in that position until January 12, 1909, when he was elected secretary of the road. For several years he has also been assistant secretary of the Omaha. By virtue of his recent election Mr. Caldwell becomes secretary of both railroads, with headquarters as heretofore, at Chicago, Ill.

William C. Maxwell, whose election as vice-president of the Wabash in charge of traffic has been announced, was born at Keokuk, Iowa, on February 20, 1865, and entered railway service in 1881, as a messenger for the Chicago, Burlington & Quincy. Later he became a clerk in the local freight offices of the same road at Keokuk, and in 1884 entered the service of the St. Louis, Keokuk & Northwestern. From 1884 to 1889, he was employed in the general freight and ticket office of this road, and from 1889 to February, 1890, was chief clerk in the general freight office. From February, 1890, to December 1, 1902, he was general agent for the Chicago, Burlington & Quincy at Keokuk; from December 1, 1902, to June, 1904, he was assistant general freight



W. C. Maxwell

agent of this railroad at St. Louis, Mo., and from June, 1904, to September 1, 1905, assistant general freight agent at St. Joseph, Mo. On September 1, 1905, he was appointed assistant general

traffic manager of the Wabash, and on August 1, 1908, was promoted to general traffic manager, the position he held up to the time of his recent election to the vice-presidency.

The title of George B. Elliott, assistant general counsel of the Atlantic Coast Line, has been changed to general solicitor. Mr. Elliott is also assistant secretary, with headquarters at Wilmington, N. C.

William O. Bunker, whose appointment as general superintendent of freight claims for the Chicago, Rock Island & Pacific was announced last week, was born on June 4, 1870, at Terre Haute, Ind. He was



W. O. Bunker

educated in the public schools at Burlington, Iowa. He entered railway service in October, 1884, and until 1889, was consecutively clerk in the local and general freight departments of the Burlington, Cedar Rapids & Northern at Cedar Rapids, Iowa. From 1889 to 1892, he was chief claim clerk in the general freight department of the same road; from 1892 to 1893, he was tariff clerk in the general freight department of the Illinois Central at Chicago, Ill.; from 1893 to 1902, he was chief clerk in the freight claim department of the Burlington, Cedar Rapids & Northern Railway at Cedar Rapids, Iowa. From 1902 to 1903, he was stationed at Little Rock, Ark., as freight claim agent of the Choctaw, Oklahoma & Gulf. In 1903, he came to Chicago as assistant freight claim agent of the Rock Island, and in 1907 was appointed freight claim agent of the same railroad.

William Little Seddon, whose election as vice-president of the Seaboard Air Line, with headquarters at Norfolk, Va., has already been announced in these columns, was born on October



W. L. Seddon

14, 1862, in Stafford county, Va. He graduated from the University of Missouri in July, 1881, and from 1881 to 1898 was engaged in civil engineering. Part of this time he served as United States assistant engineer at work on the Missouri and Mississippi rivers; chief engineer of the St. Louis Electric Railway & Power Company; contracting street railway construction in Kansas and as secretary and treasurer of the Atlantic Traction Company. He entered the service of the Seaboard Air Line in 1898, in the engineering department, and was consecutively to 1905 instrument man, resident engineer, and assistant engineer. In September, 1905, he was appointed chief engineer, and in January, 1913, he was made assistant to the president. On April 1, 1914, he became first assistant to the president in charge of operation, which position he held at the time of his recent election as vice-president of the same road, as above noted.

Thomas A. Polleys, whose appointment as tax commissioner

of the Chicago & North Western and the Chicago, St. Paul, Minneapolis & Omaha was announced in our columns last week, was born at Trempeleau, Wis., on January 31, 1865. After graduating from the law school at the University of Wisconsin, he practised law at Madison, Wis., from 1888 to 1896—the larger part of that time with the firm of Bashford, O'Connor, Polleys & Aylward. On January 17, 1896, he became an attorney for the Omaha. In June, 1901, he was appointed assistant general attorney of the Chicago Great Western and remained with this road until July 1, 1903, when he returned to the Omaha, as tax commissioner. In October, 1907, he became secretary, right of way commissioner and tax commissioner of the same road. He continued to discharge the duties of these positions until December 1, 1915, when his recent appointment took effect.



T. A. Polleys

Operating

H. D. Emerson has been appointed general manager of the New Orleans Southern & Grand Isle, with office at New Orleans, La.

F. J. McKee, superintendent of the Sarnia tunnel terminals of the Grand Trunk, at Pt. Huron, Mich., has been appointed assistant superintendent of the Detroit terminals, with office at Milwaukee Junction, Mich.

D. R. Campbell, superintendent of construction for the Canadian Northern, western lines, has been appointed general superintendent of the Pacific division, with office at Vancouver, B. C. B. T. Chappell, superintendent district 2, at Saskatoon, Sask., has been appointed superintendent of the Pacific division, with office at Kamloops Junction, B. C. T. J. Brown, chief dispatcher of district 1, central division, at Pt. Arthur, Ont., has been appointed superintendent of district 2, western division, at Saskatoon, vice Mr. Campbell. J. W. Crane, chief dispatcher, district 2, Saskatoon, has been appointed chief dispatcher, Pacific division, with office at Kamloops Junction, B. C.

George Leon Candler, who has been appointed general superintendent of the Central of Georgia, with office at Savannah, Ga., was born in Talbot county, Ga., and was educated in the public schools. He began railway work on August 1, 1880, with the Louisville & Nashville, and was in the freight agency department of that road at Montgomery, Ala., until 1887. He entered the service of the Central of Georgia in February, 1887, as chief clerk to the superintendent of the Columbus division at Columbus, Ga. From 1890 to 1892 he was chief clerk to the superintendent of the combined Southwestern and Columbus divisions at Macon. In 1894 he was appointed freight agent at Columbus, and from 1898 to 1902 was trainmaster of the Southwestern division at Macon. He was then promoted to superintendent of the Savannah division at Savannah, and on March 17, 1906, was appointed superintendent of transportation at Savannah, serving in that capacity until his recent appointment as general superintendent of the same road, with office at Savannah.

Charles H. Doorley, whose appointment as superintendent of the Gary division of the Elgin, Joliet & Eastern has been announced, was born at St. Catherine, Ont., on March 24, 1866. He received his education in the public schools of Chicago, and entered railway service with the Grand Trunk as a wiper in March, 1884. He was soon made a foreman, and in April, 1886, was promoted to engine hostler. In May, 1886, he left the mechanical department to become a switchman for the

same company, and in January, 1887, entered the service of the Chicago & Alton in the same capacity. He was promoted to yardmaster in 1889, and remained in that position until 1896. In February, 1896, he entered the employ of the Chicago, Hammond & Western as general yardmaster, and continued in that capacity until March, 1898. In April, 1898, he became a switchman for the Chicago, Lake Shore & Eastern; in August, 1899, he was promoted to assistant yardmaster; in September, 1901, he was appointed night general yardmaster; in August, 1903, general yardmaster; in December, 1908, assistant superintendent; in April, 1915, superintendent of terminals of the Elgin, Joliet & Eastern at Joliet, Ill. (the E., J. & E. having absorbed the C. L. S. & E. on June 1, 1909); in September, 1915, acting superintendent of the Gary division; and on December 1, superintendent.

Traffic

W. A. Hopkins, general live stock agent of the Wabash, has been promoted to assistant general freight agent, with headquarters at St. Louis, Mo.

A. Brostedt, district freight agent of the Canadian Northern at Calgary, Alta., has been appointed district freight and passenger agent at Vancouver, B. C. B. R. Marsales, district freight agent at Regina, Sask., has been transferred to Calgary, vice Mr. Brostedt. W. A. Whyte, city freight agent at Calgary, has been appointed district freight agent at Regina, succeeding Mr. Marsales.

William M. Hardin, whose appointment as assistant general freight agent of the Minneapolis & St. Louis has been announced in these columns, was born at Independence, Mo., on May 3, 1878. He received a high school education, and early in 1895 entered railway service as a station helper for the Chicago & Alton at Independence. In the fall of the same year he was transferred to the train service of the same railroad. During November, 1897, he entered the employ of the Chicago, Milwaukee & St. Paul as a telegraph operator, and in September, 1898, took a similar position with the Minneapolis & St. Louis. He continued in the employ of this road as telegraph operator and subsequently as relief agent, until April 1, 1903, when he was appointed traveling freight agent. On January 1, 1909, he was promoted to commercial agent, with office at Kansas City, Mo., and on January 1, 1912, he was transferred in the same capacity to Minneapolis, Minn., where he has remained up to the time of his recent promotion. As assistant general freight agent he will continue to have headquarters at Minneapolis.



W. M. Hardin

William Alexander Hopkins, who has been appointed assistant general freight agent of the Wabash, with office at St. Louis, Mo., was born on February 9, 1866, at Roxboro, N. C. He attended the common schools until September, 1882, and entered railway service in April, 1883, with the Wabash Western. In 1887 he entered the employ of the Missouri Pacific at Kansas City, Mo., as a bill clerk; in 1888, he was a station agent for the Chicago, Milwaukee & St. Paul at various places, and from 1888 to 1897 worked in a similar capacity for the Wabash. From 1897 to 1907 he was live stock agent for the Wabash at Kansas City, Mo.; and from 1907 to 1909 he was commercial agent for the same railroad at Salt Lake City, Utah. From 1909 to 1912 he was division freight and passenger agent at Toledo, Ohio. He was then stationed at St. Louis, Mo., as general live stock

agent, and on December 6 was promoted to assistant general freight agent.

Ogden F. Scudder, who has been appointed land and industrial commissioner of the Chicago, Burlington & Quincy Lines East of the Missouri River, was born at Galesburg, Ill., on



O. F. Scudder

December 24, 1871. He received his education in the public grade and high schools at Galesburg. On October 1, 1887, he entered the service of the Chicago, Burlington & Quincy as an office boy, and has been continuously in the employ of the same railroad ever since. For several years he worked as an office boy and clerk in different departments; from 1890 to September, 1906, he was employed consecutively as stenographer and claim adjuster in the law department. Since 1906, he has been in the real estate department as right of way agent and later as assistant real estate and industrial commis-

sioner, the position he held up to the time of his recent appointment. Mr. Scudder's headquarters will continue to be at Chicago, Ill.

Stanley H. Johnson, whose appointment as freight traffic manager of the Chicago, Rock Island & Pacific has been announced, was born at Bunker Hill, Ill., on February 2, 1872. He was educated in a high school at St. Louis, Mo. In 1888, he entered railway service as a stenographer of the Southern Interstate Association at St. Louis. From that time until 1894, he held similar positions in the freight traffic department of the Missouri Pacific at St. Louis, in the offices of the East Tennessee, Virginia & Georgia at Knoxville, Tenn., and with the Chesapeake, Ohio & Southern at Louisville, Ky. From 1894 until June, 1902, he was employed in the Southwestern Freight Bureau at St. Louis, in various positions, including that of secretary. From June,



S. H. Johnson

1902, to 1904, he was chief clerk to the third vice-president and freight traffic manager of the Rock Island; from 1904, to 1906, he was assistant general freight agent of the same railroad at Little Rock, Ark. From 1906, to February 14, 1909, he held the same position at Chicago, Ill. From February 14, 1909, to December 1, 1915, he has been assistant freight traffic manager. His headquarters will continue to be at Chicago, Ill.

William S. Burley has been appointed assistant land and industrial commissioner of the Chicago, Burlington & Quincy lines east of the Missouri river. Mr. Burley was born at Aurora, Ill., and received his education in the public schools and at a business college. He also studied law for two years. In 1883 he entered railway service as a messenger in the office of the Chicago superintendent of the Burlington. In 1890 he

was appointed chief clerk in the superintendent's office at Chicago. In 1902 he was promoted to chief clerk in the general superintendent's office at Burlington, Iowa. In 1905 he was transferred to the land and industrial department at Chicago as chief clerk and right-of-way agent. His office will continue to be at Chicago, and his appointment was effective December 1.

C. H. Stinson, whose appointment as freight traffic manager of the Wabash has been announced, was born at Beaver Falls, Pa., on November 19, 1871. He entered railway service in



C. H. Stinson

1885, as a messenger boy in the local freight office of the Chicago, Milwaukee & St. Paul, at Chicago, Ill. In 1888, he left the St. Paul to enter the employ of the Wabash, as a clerk in the office of one of the Wabash fast freight lines. Subsequently he filled the positions of chief clerk to the general manager of the Hoosac Tunnel Line, contracting freight agent, traveling freight agent, and agent of the Hoosac Tunnel Line, at Chicago. With the reorganization of the Wabash fast freight lines, he went to St. Louis, Mo., to become chief clerk to the general traffic manager.

Within one year he was made assistant general freight agent, and on August 20, 1908, was promoted to general freight agent. Mr. Stinson has been in railroad service for 30 years, 3 years with the St. Paul and 27 with the Wabash. His headquarters will continue to be at St. Louis.

G. H. Corse, Jr., whose appointment as foreign passenger agent of the Union Pacific system has been announced, has been in railroad and steamship service since May 11, 1890, when he



G. H. Corse, Jr.

entered the service of the Chicago, Milwaukee & St. Paul, as a telegraph operator at Davis Junction, Ill. On October 26, of the same year, he first became an employee of the Union Pacific, at Ogden, Utah. His experience in promoting foreign traffic dates from December 1, 1906, when he went to Hong Kong, China, as freight agent of the Pacific Mail Steamship Company. On February 1, 1909, he was appointed general Oriental agent for the Chicago, Milwaukee & St. Paul, at Shanghai, China. On December 1, 1911, he was appointed general passenger agent of the

San Francisco Overland Routes, comprising the Pacific Mail Steamship Company, the Southern Pacific, the Union Pacific, the Atchison, Topeka & Santa Fe, the Chicago & North Western and the St. Paul, with office at Yokohama, Japan and Hong Kong. He resigned this position on July 1, 1915, to return to the United States as special agent in the passenger department of the Union Pacific, with headquarters at Chicago, Ill. As foreign passenger agent he will continue to have his headquarters at Chicago.

William P. Hinton, whose appointment as traffic manager of

the Grand Trunk Pacific and the National Transcontinental, with office at Winnipeg, Man., has been announced, was born at Hintenburg, Ont., on August 30, 1871, and entered railway service in May, 1887. From that time until August, 1891, he was consecutively clerk of freight, passenger and car accounts, and traveling auditor for the Canada Atlantic; from August, 1891, to March, 1898, he was rate clerk for the same railroad, and accountant of the Canada Atlantic Fast Freight Line; from March, 1898, to June 30, 1901, he was assistant general freight agent of the same road, and the Canada Atlantic Transit Company; from June 30, 1901, to January 30, 1903, general freight agent of the same road; January 30, 1903, to October, 1905, general passenger and freight agent of the same railroad; October, 1905, to January, 1907, general agent, passenger department, of the Grand Trunk at Ottawa, Ont.; January, 1907, to April, 1909, assistant general passenger and ticket agent of the same road at Montreal; April, 1909, to February, 1914, general passenger agent, Grand Trunk at Winnipeg, Man.; February to October, 1914, assistant passenger traffic manager of the same railroad at Winnipeg; October, 1914, to November 11, 1915, assistant passenger traffic manager of the Grand Trunk and the Grand Trunk Pacific at Montreal, Que.

Engineering and Rolling Stock

J. W. Fox has been appointed valuation engineer of the Central of Georgia, succeeding H. D. Pollard, resigned.

Geo. Moth has been appointed district master mechanic and trainmaster of the Canadian Pacific, Alberta division, fifth district.

B. Corbett has been appointed master mechanic of the Missouri, Kansas & Texas, at Smithville, Tex., vice J. R. Greiner, resigned.

O. K. Morgan, office engineer of the Carolina, Clinchfield & Ohio at Johnson City, Tenn., has assumed the duties of the office of chief engineer.

C. N. Beckner, assistant signal engineer of the Louisville & Nashville at Louisville, Ky., has entered the service of the Federal Signal Company as superintendent of construction in western territory, with headquarters at Chicago, Ill.

C. H. Fox, assistant division engineer of the Canadian Pacific at Winnipeg, Man., has been appointed resident engineer, district 2, Manitoba division, vice E. L. Landorff, transferred. The position of assistant division engineer has been abolished.

T. L. Reed, assistant master mechanic of the Seaboard Air Line at Hamlet, N. C., has been appointed master mechanic of the North Carolina division, with headquarters at Hamlet, N. C. The position of assistant master mechanic is abolished. G. H. Langton, master mechanic at Raleigh, will have charge of the Virginia division, including Raleigh shops and roundhouse.

H. L. Vercoe has been appointed special engineer of the Canadian Northern, lines west of Port Arthur, Ont., with headquarters at Winnipeg, Man. W. T. Moodie, engineer maintenance of way, with office at Winnipeg, has been appointed division engineer, central division, with headquarters at the same city. T. Lucas, engineer maintenance of way, west of Winnipeg, has been appointed lease engineer, lines west of Port Arthur, Ont., with office at Winnipeg. A. T. Fraser, district engineer at Edmonton, Alta., has been appointed division engineer, western division, with headquarters at the same city.

G. H. Hedge, master mechanic of the central division of the Canadian Northern, has been appointed general master mechanic of western lines, with office at Winnipeg, Man. Mr. Hedge was born at Neath, Wales, on May 26, 1865, and entered railroad service in 1879 as a machinist apprentice with the Great Western in England. In 1884 he came to Canada, entering the service of the Canadian Pacific as a fitter. He worked in shops of this railroad at Ottawa, Schreiber, Montreal, Hochelaga, and again at Montreal, and in 1891 was appointed locomotive foreman at Megantic, Que. In 1893 he was transferred to Farnham, Que., and subsequently to Montreal; in 1896 he was promoted to general locomotive foreman of the same road at Farnham, Que.; from 1901 to 1902 he was locomotive foreman at Medicine Hat, Alta.; from 1902 to January, 1903, he held the same position at Brandon, Man.; from January, 1903, to June, 1908, he was locomotive foreman of the Canadian Northern at Port Arthur,

Ont.; from June, 1908, to January, 1912, he was assistant master mechanic of the same road at Winnipeg, Man.; from January, 1912, up to the time of his recent appointment, he was master mechanic of the central division of the same road at Winnipeg.

Purchasing

C. L. Bankson, has been appointed assistant purchasing agent of the Great Northern, with office at Seattle, Wash., vice A. Watson.

OBITUARY

Charles W. Lord, office engineer of the New York, New Haven & Hartford, at New Haven, Conn., died on December 11, at the age of 52.

Thomas James Hennessey, who was division master mechanic of the Michigan Central from May, 1893, to February 1, 1915, died on December 4, at the age of 70.

Ward Crosby, chief engineer of the Carolina, Clinchfield & Ohio, with office at Johnson City, Tenn., died on December 5, at his home in that city. Mr. Crosby was born on May 1, 1859,



W. Crosby

at Crompton, Que., and began railway work in March, 1880, as transitman on the Eastern Railroad, now a part of the Boston & Maine. From March, 1881, to February, 1882, he was transitman on location work of the Texas-Mexican in Texas, and then to March, 1884, was assistant engineer on the Mexican Central, now a part of the National Railways of Mexico. From September, 1885, to April, 1888, he was first assistant, and later division engineer of the Boston & Lowell, now a part of the Boston & Maine; then to November, 1889, was engineer of location and construction of the Barre Railroad, now the Barre & Chelsea. In November, 1889, he was appointed resident engineer on the Norfolk & Western, and from May, 1891, to September, 1905, was assistant and division engineer of the Concord & Montreal, and its successor, the Boston & Maine. In September, 1905, he went to the Carolina, Clinchfield & Ohio, and served consecutively as division engineer and assistant chief engineer until November, 1911, when he was promoted to chief engineer of the same road.

THE KATANGA RAILWAY.—A British consular report on the trade of Katanga (Belgian Congo) during 1914 says that the railway north from Kambove to Bukama has been actively continued during the past year. The total distance, by the route now adopted, is 204 miles. December 31 the rails were laid for 69 miles, and at the time of writing, March, 1915, 86 miles have been finished. The roadbed is completed over 96 miles. The railway has now arrived on the high Bianco plateau, which is free from tsetse fly, making it possible to land breeding stock there by rail. The headquarters of the construction has now been moved from Kambove to 66 miles beyond, and this section of the road is now being used for the regular transport of passengers and merchandise. It is at present impossible to say when the railway will reach Bukama, as on account of the war the construction has been very largely curtailed. Kambove is connected by rail with South Africa via Elisabethville, and when the line reaches Bukama there will be complete connection between South Africa and Boma by rail and water. The railway under construction between Kabalo, on the Lualaba river, and Lukuga, on Lake Tanganyika, a distance of about 250 miles, is now practically completed, but has not been pushed quite to the shore of the lake, as the Germans are masters of this latter at present.

Equipment and Supplies

LOCOMOTIVES

THE VIRGINIAN is understood to be contemplating the purchase of a number of locomotives.

THE BUFFALO, ROCHESTER & PITTSBURGH is contemplating the purchase of a number of locomotives.

THE DELAWARE, LACKAWANNA & WESTERN, it is reported, is considering the purchase of motive power.

THE CHICAGO GREAT WESTERN has ordered 5 Mikado type locomotives from the Baldwin Locomotive Works.

THE DEATH VALLEY RAILROAD has ordered one Consolidation locomotive from the Baldwin Locomotive Works.

THE CARNEGIE STEEL COMPANY has ordered 2 six-wheel switching locomotives from the Baldwin Locomotive Works.

THE TOLEDO, ST. LOUIS & WESTERN has ordered 5 Consolidation locomotives from the Lima Locomotive Corporation.

THE FAIRCHILD & NORTHEASTERN, noted in last week's issue as having issued an inquiry for one Prairie type locomotive has ordered this engine from the Vulcan Iron Works.

THE DELRAY CONNECTING has ordered one eight-wheel switching locomotive from the American Locomotive Company. This locomotive will have 22 by 28-in. cylinders, 51-in. driving wheels and a total weight in working order of 208,000 lb.

THE WAYNESBURG & WASHINGTON has ordered one Mogul type locomotive from the American Locomotive Company. This locomotive will have 13 by 20-in. cylinders, 41-in. driving wheels and a total weight in working order of 50,000 lb.

THE CUBA RAILROAD has ordered 10 superheater ten-wheel locomotives from the American Locomotive Company. These locomotives will have 21 by 26 in. cylinders, 60 in. driving wheels and a total weight in working order of 148,000 lb.

THE PUNTA ALEGRA SUGAR COMPANY has ordered one four-wheel switching locomotive from the American Locomotive Company. This locomotive will have 11 by 16-in. cylinders, 33-in. driving wheels and a total weight in working order of 39,000 lb.

THE PULLMAN RAILROAD, reported in last week's issue as being in the market for a switching locomotive, has ordered two six-wheel switching locomotives from the American Locomotive Company. These locomotives will have 21 by 26-in. cylinders, 51-in. driving wheels and a total weight in working order of 142,000 lb.

FREIGHT CARS

THE CHICAGO, MILWAUKEE & ST. PAUL is building 500 60-ton ore cars in its shops at Milwaukee.

THE NEW YORK, PHILADELPHIA & NORFOLK has issued inquiries for 45 to 60 steel underframe box cars.

THE RAY CONSOLIDATED COPPER COMPANY has ordered 50 ore cars from the Pressed Steel Car Company.

THE AMERICAN ZINC, LEAD & SMELTING COMPANY has issued inquiries for 50 100,000-lb. capacity tank cars.

THE UTAH COPPER COMPANY is reported to have ordered 100 ore cars from the Standard Steel Car Company.

THE ELGIN, JOLIET & EASTERN has given the Pullman Company an order to repair 300 steel hopper cars.

THE PRUDENTIAL OIL CORPORATION has ordered 50 tank cars from the American Car & Foundry Company.

THE MISSOURI, KANSAS & TEXAS has ordered 6,000 underframes from the Commonwealth Steel Company.

THE PERE MARQUETTE has ordered 200 center constructions from the Western Steel Car & Foundry Company.

THE ILLINOIS CENTRAL is inquiring for prices on 1,000 center sills for coal cars and 500 center sills for sand cars.

THE DELAWARE, LACKAWANNA & WESTERN has ordered 300 gondola cars from Barney & Smith Car Company and 200 gondola cars from the Standard Steel Car Company.

THE NEW YORK, ONTARIO & WESTERN has ordered 400 hopper

cars from the Cambria Steel Company, and 100 low-side gondola cars from the American Car & Foundry Company.

THE AMERICAN SHEET & TIN PLATE COMPANY was reported in an unconfirmed item in last week's issue as having ordered 6 tank cars from the German-American Car Company. This item has since been confirmed.

THE GRAND TRUNK, which was reported in last week's issue as being about to repair 1,500 steel coal cars, has closed a contract with the American Car & Foundry Company for repairs to 300 cars, with an option on an additional 1,200.

THE NEW JERSEY ZINC COMPANY, reported in the *Railway Age Gazette* of December 10 as being in the market for 40 hopper cars, has ordered 10 hopper cars from the Pressed Steel Car Company and another 10 from the Standard Steel Car Company.

THE NEW YORK, NEW HAVEN & HARTFORD, which has been reported in recent issues of this paper as being in the market for 25 milk and 50 refrigerator cars, has now issued definite inquiries for 25 milk and 500 refrigerator cars. As noted in last week's issue, will also buy 500 coal cars.

NATIONAL GUARD OF NEW YORK.—A group of steel makers and others under the lead of Elbert H. Gary, chairman of the Steel Corporation, and Charles M. Schwab, president of the Bethlehem Steel Corporation, are contributing toward the presentation of an armored train to the National Guard of New York. The train will have a battle car heavily protected with armor plate and six or seven lightly armored cars equipped with machine guns and capable of high speed. The steel makers have promised to contribute and to furnish the armor plate and other metal parts of the train at cost.

PASSENGER CARS

THE WESTERN PACIFIC recently ordered five all-steel baggage and mail cars from the American Car & Foundry Company.

THE CENTRAL OF GEORGIA has ordered four express cars and one combination baggage and mail car from the Pullman Company.

PENNSYLVANIA LINES WEST. In the item relative to this company's recent orders for passenger cars in last week's issue it was incorrectly stated that the company had ordered 22 coaches and 7 passenger and baggage cars from the Pullman Company. These cars were ordered of the Pressed Steel Car Company, the Pullman Company having received only the one order for 12 baggage and mail cars and 6 dining cars.

THE PENNSYLVANIA RAILROAD, reported in the *Railway Age Gazette* of November 12 as being in the market for 100 coaches, 20 passenger and baggage cars, 55 baggage cars and 5 horse-express cars for the Lines East of Pittsburgh, a total of 180 cars, has placed orders for 107 of these cars as follows: American Car & Foundry Company, 21 baggage and 5 horse-express cars; Pressed Steel Car Company, 6 coaches; Harlan & Hollingsworth Corporation, 47 coaches, and the J. G. Brill Company, 28 baggage cars. Of the 21 baggage cars ordered from the American Car & Foundry Company 11 are for the Pennsylvania itself, 7 for the Philadelphia, Baltimore & Washington, and 3 for the West Jersey & Seashore; the 5 horse-express cars are for the Pennsylvania. The 6 coaches ordered from the Pressed Steel Car Company and the 28 baggage cars ordered from the J. G. Brill Company are also for the Pennsylvania. The 47 coaches ordered from the Harlan & Hollingsworth Corporation are for the West Jersey & Seashore.

IRON AND STEEL

THE ANN ARBOR is inquiring for 1,500 tons of 85-lb. rails.

THE TOLEDO, ST. LOUIS & WESTERN is inquiring for 10,000 tons of 85-lb. rails.

THE SOUTHERN RAILWAY has ordered 10,000 tons of rails from the Maryland Steel Company.

THE MINNEAPOLIS & ST. LOUIS has ordered 7,500 tons of rails from the Illinois Steel Company.

THE TOLEDO TERMINAL RAILROAD has ordered 1,000 tons of rails from the Algona Steel Corporation.

THE CHICAGO, BURLINGTON & QUINCY is inquiring for 2,000 tons of bridge steel for 1916 delivery.

THE INTERNATIONAL & GREAT NORTHERN is reported to be in the market for 1,500 tons of 90-lb. rails.

THE NEW YORK, CHICAGO & ST. LOUIS has ordered 9,000 tons of rails from the Illinois Steel Company.

THE CAROLINA, CLINCHFIELD & OHIO has ordered 1,000 tons of rails from the Carnegie Steel Company.

THE LEHIGH VALLEY has ordered 820 tons of steel for bridge work from the Pennsylvania Steel Company.

THE CHICAGO & EASTERN ILLINOIS has been authorized by the Federal court to buy 10,000 tons of rails to apply on its 1916 requirements.

THE DULUTH & IRON RANGE has ordered 650 tons of steel for ore spouts for dock No. 6 at Two Harbors, Minn., from the American Bridge Company.

THE PENNSYLVANIA RAILROAD has ordered 450 tons of bridge material for its ore handling bridge at Erie, Pa., from the Pennsylvania Steel Company.

THE NEW YORK PUBLIC SERVICE COMMISSION, First district, has let a contract to the Ramapo Iron Works for special work on order No. 6, consisting of frogs and switches, for the new Lexington avenue subway in New York City. The company's bid was the lowest at \$46,195.

MACHINERY AND TOOLS

THE BALTIMORE & OHIO is in the market for 15 to 20 machine tools.

THE DELAWARE & HUDSON is in the market for approximately 40 machine tools.

THE PENNSYLVANIA RAILROAD will make extensive improvements to its docks at Erie, Pa., and will install a new ore-handling plant equipped with machinery made by the Mead-Morrison Manufacturing Company, Boston, Mass.

THE PENNSYLVANIA EQUIPMENT COMPANY, Philadelphia, Pa., is in the market for a second-hand shear, able to shear 1½ in. by 1½ in. or ¾ in. by 6 in. cold soft steel, or to punch a 1-in. hole in a ¾-in. plate, floor space 8 ft. 3 in. by 6 ft.; to be arranged for motor drive. It will also buy a roller straightener, or gag press for 6 in. by 6 in. angles.

SIGNALING

THE WESTERN MARYLAND proposes during the coming year to install automatic block signals on 106 miles of its line.

THE CUMBERLAND VALLEY proposes during the coming year to install automatic block signals on its line near Berkeley, six miles, single track.

CHICAGO, ROCK ISLAND & PACIFIC.—This company's plan for the ensuing year include the installation of automatic block signals on five miles of road, double track.

THE CLEVELAND, CINCINNATI, CHICAGO & ST. LOUIS contemplates the installation of automatic block signals during the coming year on its line from Bellefontaine, Ohio, to Anderson Ind., 106 miles, single track.

THE SOUTHERN RAILWAY proposes during 1916 to install automatic block signals on 178 miles of its line. The plans for the coming year include also two large mechanical interlocking plants, one at Charlottesville, Va., 48 levers, and one at Danville, Va., 40 levers.

THE ATCHISON, TOPEKA & SANTA FE plans during the coming year to install automatic block signals on seven miles of its line, double track, between Standish, Mo., and Carrollton; ten miles, double track, between Le Loup, Kan., and H. U. Tower, and between Claremont, Cal., and Arcadia, 20 miles, single track. Of these three installations, the two last named have already been begun. During 1916 the company proposes to install electric interlocking, 36 levers, at Arcadia, Cal., jointly with the Southern Pacific and the Pacific Electric; and at Los Angeles, Cal., electric interlocking, 80 levers, jointly with the Salt Lake Route and the Southern Pacific.

Supply Trade News

The Northern Pacific will purchase several million feet of lumber.

The Norfolk Southern is inquiring for 3,000,000 ft. of lumber to apply on its 1916 requirements.

The Chicago & North Western is inquiring for 5,000,000 ft. of lumber.

The Maryland Steel Company will erect an addition costing \$100,000 to its plant at Sparrows Point, Md.

Charles W. Cross has been appointed vice-president of the Equipment Improvement Company, New York.

The Chicago, Milwaukee & St. Paul is inquiring for prices on 15,000,000 ft. of fir, pine and hard wood for its 1916 requirements.

Fairbanks, Morse & Co., Chicago, have closed a contract with the Missouri, Kansas & Texas for the installation of a large capacity conveyer type coaling station at Osage, Okla.

The Burdett Oxygen Company completed a new plant at Ft. Worth, Tex., on December 15. This is the ninth plant to be erected by the company in various industrial centers of the country.

The Chicago & North Western has ordered 3,000,000 ft. of fir for dock extension work at Ashland, Wis. The order was divided between the Douglas Fir Sales Company and the Lumber Manufacturers' Agency.

C. N. Beckner, assistant signal engineer of the Louisville & Nashville, has entered the service of the Federal Signal Company as superintendent of construction in western territory, with headquarters at Chicago, Ill.

A. F. Huston, president of the Lukens Iron & Steel Company, Coatesville, Pa., has recently announced that his company has placed an order for a plate mill which will be able to roll a plate 200 to 204 in. wide and which will be the largest plate mill in existence in the world at the present time.

A majority of the stockholders of the Youngstown Steel & Tube Company voted last Tuesday to accept an offer made by the Replogle interests in the Cambria Steel Company, mentioned in last week's issue, for their stock, the price being \$300 a share for the common and \$80 a share for the preferred.

The Peyton Safety Rail Joint Company, St. Louis, Mo., has been incorporated with capital stock of \$200,000, with the following stockholders: C. W. Witwer, president; W. M. Grissom, Warren Perry and Isaac Peyton. The company will engage in the manufacture of rail joints and is reported to have contracts from two large railways.

The Crawford Locomotive & Car Company, Streator, Ill., has been taken over by its creditors and the property will be offered for sale at an early date. The property of the company includes several modern and well equipped shop buildings and 25 acres of land having connection with three railroads and easy access to two others that enter the city.

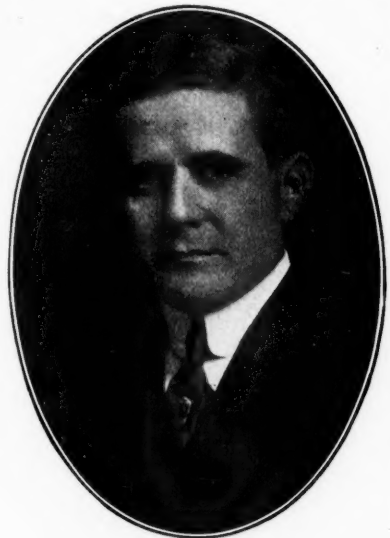
The Midvale Steel & Ordnance Company has announced that it will spend approximately \$6,000,000 for improvements in the plant of the Midvale Steel Company, Nicetown, Pa., and that of the Worth Brothers Company, Coatesville, Pa., and that it has acquired all the capital stock of the Buena Vista Iron Company, owning 300,000,000 tons of merchantable Cuban iron ore, containing 1 per cent nickel. The improvements to the two plants include the installation at the Coatesville plant of six 50-ton open hearth furnaces with a capacity of 180,000 tons of ingots a year, a blooming mill with an annual capacity of 200,000 tons, two 750 k. w. turbo generators, one 500-ton blast furnace with an annual capacity of 175,000 tons of pig iron, with sufficient auxiliary equipment for another similar furnace which may be authorized soon after the first of the year, a new forging department, consisting of a 2,500-ton hydraulic press, one 1,500-ton hydraulic press and two draw benches; the installation of 8, 12 and 15-in. bar mills, a steel tire department and a rolled

steel wheel department. The improvements at Nicetown include new steel manufacturing and machine shop equipment which in particular will enable the company to handle orders recently taken from the United States government for heavy ordnance, such as 14 and 16-in. guns. The company's announcement concludes: "The acquiring of this property (the Buena Vista Iron Company) will place the steel-making subsidiaries of the company, the Midvale Steel Company and Worth Brothers Company, in a strong position and will enable the company to proceed with the extensive additions contemplated at Coatesville and Philadelphia, with full assurance of a supply of raw material on a basis which will enable them to compete on even terms with any other producer."

N. S. Reeder, vice-president of the Pressed Steel Car Company and the Western Steel Car & Foundry Company, graduated from Cornell University with the degree of mechanical engineer in 1896. He then served as a special apprentice on the Pennsylvania Lines West of Pittsburgh, and in 1899 was employed by the Pittsburgh Coal Company as superintendent of the Montour and Moon Run Railroads. In 1902 he entered the service of the Pressed Steel Car Company as a mechanical engineer connected with the New York office, but in 1904 he went to Montreal as assistant general manager of the Canada Car Company. In 1906 he was made general manager, and in 1908 became second vice-president of the Canadian Car & Foundry Company. He returned to the States in 1909 as vice-president of the Western Steel Car & Foundry, and in 1910 was made second vice-president of the Pressed Steel Car Company in Chicago. He is now transferred to the company's New York office, effective December 1. James Brown Rider, the newly elected vice-president and general manager of the Pressed Steel Car Company and the Western Steel Car & Foundry Company, entered the service of the Pennsylvania Railroad in 1895, and remained with it until 1899, acting successively as messenger boy, shop order clerk, invoice clerk and stenographer. In 1899 he became connected with the Pressed Steel Car Company as stenographer and clerk to the general manager, being advanced to the position of assistant to the vice-president in July, 1905. He was appointed general manager in July, 1909, and made a member of the board of directors in Jan., 1913. He was appointed general manager of the Western Steel Car & Foundry Company August, 1913. He is now elected a vice-president of the Pressed Steel Car Company and Western Steel Car & Foundry Company, with headquarters in Pittsburgh, Pa., and will also continue to perform the duties of general manager in charge of operations. His title is vice-president and general manager of both the Pressed Steel Car Company and the Western Steel Car & Foundry Company.



N. S. Reeder



J. B. Rider

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J. F. MacEnulty, who was elected second vice-president of the Pressed Steel Car Company and the Western Steel Car & Foundry Company, December 1, entered the employ of the Pressed Steel Car Company in 1899, and has been its general sales manager since May, 1912. He was first an inspector at Pittsburgh, later being promoted to the positions of chief inspector, general chief inspector and engineer of construction. He was transferred to the sales department in New York in 1904, and in 1907 was made general superintendent of the Hege-wisch Works of the Western Steel Car & Foundry Company. In 1909 he was promoted to the position of general manager, and in May, 1912, returned to New York as general sales manager of both the Pressed Steel Car Co., and Western Steel Car & Foundry Co.



J. F. MacEnulty

C. E. Postlethwaite, who since December 1 has been general sales manager of the Pressed Steel Car Company and the Western Steel Car & Foundry Company, with headquarters in New York, was until that date manager of sales for the central district at Pittsburgh, Pa. He was born in Mount Union, Huntington county, Pa., and after graduating from the Altoona high school in 1883 entered the service of the Pennsylvania Railroad, where he remained until 1890, acting successively as rodman on an engineer corps, telegraph operator and Pennsylvania Railroad division car clerk. For the following seven years he was connected with the Norfolk & Western as chief clerk to the general superintendent at Roanoke, and later as assistant to the general agent at Norfolk. He became connected with the Schoen Pressed Steel Car Company in October, 1897, shortly after the first steel freight cars were built, and remained with the company when it was merged into the Pressed Steel Car Company. Mr. Postlethwaite entered the sales department of the company in February, 1902.



C. E. Postlethwaite

The Youngstown Steel Car Company was recently organized at Youngstown, Ohio, to assume the business of the Youngstown Car & Manufacturing Company, designers and builders of industrial equipment. J. E. Tesseyman, formerly of the Ralston Steel Car Company, Columbus, Ohio, has assumed the duties of general manager, and plans are being formulated for enlarging the company's output. The company is entering the field of repairing steel cars, and is at present making prompt deliveries on pressed steel parts.

William Andrew Conner, first vice-president of the Standard Underground Cable Company, Pittsburgh, Pa., died suddenly in his office at Perth Amboy, on December 6. Mr. Conner was born in Baltimore, Md., September 12, 1859. In 1876 he entered the oil refining business, holding eventually the position of assistant manager for the Standard Oil Company. In 1885 he took charge of the first plant built by the Standard Underground Cable Company in Pittsburgh, and from then until his death

He then served as a special apprentice on the Pennsylvania Lines West of Pittsburgh, and in 1899 was employed by the Pittsburgh Coal Company as superintendent of the Montour and Moon Run Railroads. In 1902 he entered the service of the Pressed Steel Car Company as a mechanical engineer connected with the New York office, but in 1904 he went to Montreal as assistant general manager of the Canada Car Company. In 1906 he was made general manager, and in 1908 became second vice-president of the Canadian Car & Foundry Company. He returned to the States in 1909 as vice-president of the Western Steel Car & Foundry, and in 1910 was made second vice-president of the Pressed Steel Car Company in Chicago. He is now transferred to the company's New York office, effective December 1. James Brown Rider, the newly elected vice-president and general manager of the Pressed Steel Car Company and the Western Steel Car & Foundry Company, entered the service of the Pennsylvania Railroad in 1895, and remained with it until 1899, acting successively as messenger boy, shop order clerk, invoice clerk and stenographer. In 1899 he became connected with the Pressed Steel Car Company as stenographer and clerk to the general manager, being advanced to the position of assistant to the vice-president in July, 1905. He was appointed general manager in July, 1909, and made a member of the board of directors in Jan., 1913. He was appointed general manager of the Western Steel Car & Foundry Company August, 1913. He is now elected a vice-president of the Pressed Steel Car Company and Western Steel Car & Foundry Company, with headquarters in Pittsburgh, Pa., and will also continue to perform the duties of general manager in charge of operations. His title is vice-president and general manager of both the Pressed Steel Car Company and the Western Steel Car & Foundry Company.

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was in charge of the manufacturing business of the company. He was the one who planned and built the plants at Perth Amboy, N. J., and Oakland, Cal. As noted above, he became vice-president of the company in 1909. He was also a vice-president and director of the Standard Underground Cable Company of Canada, Ltd., whose factories were planned and built by him at Hamilton, Ont., in 1911-1912.

Henry Phipps Hoffstot, whose appointment to the position of assistant manager of sales, central district of the Pressed Steel Car Company, with headquarters at Pittsburgh, Pa., was announced in the *Railway Age Gazette* of last week, has been in the service of the company since 1910. He graduated from Harvard College in 1909, and in the same year entered the employ of the Canadian Car & Foundry Company at Montreal and Amherst, N. S. The following year he was appointed assistant to the general manager of the Pressed Steel Car Company, and on December 1 entered the sales department of the company as assistant manager of sales, central district, with headquarters at Pittsburgh, as above noted.



H. P. Hoffstot

C. W. Cross, from 1906 to 1914 superintendent of apprentices of the New York Central Lines, has been elected vice-president of the Equipment Improvement Company, with office at 30 Church street, New York. Mr. Cross started his railroad career as a machinist apprentice on the Cincinnati, Hamilton & Dayton at Lima, Ohio. From 1880 to 1890 he was, respectively, a machinist, draftsman, foreman and assistant master mechanic in the shops of the Pennsylvania Lines at Fort Wayne, Ind. In 1890 he went to the Lake Shore & Michigan Southern as master mechanic at Elkhart, Ind., and became superintendent of apprentices for the New York Central Lines, with headquarters at New York, when that railroad revised and centralized its apprenticeship department in 1900. Mr. Cross has been a representative for the Equipment Improvement Company since July, 1914. He takes up his new duties as vice-president beginning December 15.



C. W. Cross

James Mapes Dodge, chairman of the board of directors of the Link-Belt Company, Chicago, Ill., died at his home in Philadelphia, September 4. Mr. Dodge was born June 30, 1852, at Waverly, N. J. He studied three years at Cornell University and then took a special one-year course in chemistry at Rutgers. After spending a short time at the Morgan Iron Works in New York, he entered the shops of James Roach, the shipbuilder, at Chester, Pa., where, during a three years' stay, he was successively journeyman, foreman and superintendent of erection. About 1880 he became acquainted with William D. Ewart, the inventor of the Ewart link-belt, and soon after joined him and his associates in the development of the chain business, which at that time had not attained a very great importance. He later entered into a partnership with Edward H. Burr, under the

name of Burr & Dodge, who represented in Philadelphia the Ewart Manufacturing Company of Indianapolis, then manufacturing the Ewart detachable link-belt. Out of this partnership grew the Link-Belt Engineering Company, organized in 1888. In 1889 Mr. Dodge brought out the Dodge system of storing anthracite coal in large conical piles and reloading it by machinery. For this invention he received in 1907 the Elliott Cresson gold medal from the Franklin Institute. In 1892 Mr. Dodge was elected president of the Link-Belt Engineering Company and the Dodge Coal Storage Company (later called the J. M. Dodge Company). He became chairman of the board of directors of the Link-Belt Company when it was organized in 1906 through the merger of the allied companies—the Link-Belt Engineering Company, Philadelphia; the Link-Belt Machinery Company, Chicago, and the Ewart Manufacturing Company, Indianapolis, at which time Charles Piez became president of the Link-Belt Company. Mr. Dodge was a very successful inventor. He took out over 100 patents, among them, of course, being many relating to the construction and manufacture of silent chain.

Andrew J. Farley, vice-president of the Camel Company, and for many years secretary of the Chicago Railway Equipment Company, died on December 13, 1915, at the Hyde Park hotel, Chicago, Ill. Mr. Farley was born at Schuylerville, N. Y., in 1847, and spent his early life in Troy, N. Y., where he was, at one time, engaged in the retail business. His advent with the railway supply business was with the old Dunham Manufacturing Company. When he left this company he became connected with The National Brake Beam Company, now the Chicago Railway Equipment Company, with which he spent most of his business career. About five years ago he retired from active business and has lived most of each year at his summer place at Wheaton, Ill., spending the winters in Chicago and California. He was one of the organizers of the Camel Company, and at the time of his death was vice-president. He is survived by his wife and one daughter, Mrs. James M. Hopkins.



A. J. Farley

E. H. Poetter, who, as announced in a previous issue, has been appointed manager of the general railroad sales department of the Barrett Manufacturing Company, with office at New York City, was born on September 14, 1879, at Juneau, Wis. After graduating from the high school at Beaver Dam, Wis., in 1896, he took a business college course, and in the same year entered the service of the Wisconsin Central as a stenographer in the land department at Chicago. He later became successively bill of lading clerk, chief clerk, contracting freight agent and freight and passenger agent at Seattle, Wash., to which position he was appointed in 1903. In December, 1903, he returned to Chicago, and for two years was engaged in the insurance business with the Equitable Life Insurance Company. In October, 1905, he entered the service of the



E. H. Poetter

Barrett Manufacturing Company as traffic manager at Chicago, in charge of the western territory. Later, upon a change in the company's organization, his title was changed to assistant traffic manager, with office in Chicago, from which position he is to be promoted, effective on January 1.

TRADE PUBLICATIONS

TURBINES.—"The Terry Turbine" is the title of a new bulletin just issued by The Terry Steam Turbine Company, Hartford, Conn., giving a general description of the various turbine applications, and dealing particularly with various kinds of high, low and mixed pressure turbines.

MACHINE TOOLS.—The Covington Machine Company, Covington, Va., has recently issued bulletin No. 11 containing a number of illustrations of Covington punches, shears, bending rolls, etc., for all classes service. The sole agent in the United States for these machines is Manning, Maxwell & Moore, Inc., New York.

CULVERTS.—The Canton Culvert & Silo Company, Canton, Ohio, has issued a rather unique folder containing extracts from the company's files "proving the practicability and popularity of 'Acme' (nestable) corrugated anti-corrosive No-Co-Ro metal culverts. The folder contains specimen advertisements which appeared in various technical papers and specimens of typical inquiries, orders and letters of commendation.

WIRING DEVICES.—The Bryant Electric Company, Bridgeport, Conn., has issued an elaborate catalog of 168 pages containing illustrations, descriptions, list prices, etc., of the company's line of Superior wiring devices. In the catalog there are illustrated "New Wrinkle" and "Wrinklet" sockets and other fixtures and various types of switches, receptacles, plugs and similar fixtures. The book is exceedingly well gotten up and profusely illustrated.

CONSTRUCTION OF LIGHT RAILWAYS DURING THE WAR.—It is said that 70 miles of track can be laid in two weeks by the efforts of four German railway battalions on light railways in Belgium and that this period can actually be halved by increasing the number of men engaged on construction. Operating details in regard to these light railways are very meagre, but traffic would seem to be worked on much the same methods used prior to the block system, the trains being despatched with regular intervals of about a third of a mile between them. This particular form of light railway is not to be confused with the temporary lines used by the Germans for the removal of heavy guns and ammunition. The motive power of the latter lines is horse traction, and it has been found possible to lay about two-thirds of a mile of track in an hour. These figures are, of course, made possible by transporting the track in ready-laid sections which have only to be placed in position and joined up.

RAILWAY EXTENSION IN COREA.—A British consular report on the trade of Corea for 1914 states that the second railway program, which consisted in the building of lines connecting the capital with Wonsan (Gensan) on the northeast coast and Taiden on the Seoul-Fusan line with Kunsan and Mokpo in the southwest, was completed in 1914, the Kōnan (Honam) Railway being finished in January and the Keigen (Seoul-Gensan) Railway in August. Work on the Gensan-Yongheung line, which forms a part of the third program, was started on October 1, and that portion of the track which runs from Gensan to Mun-chong, a distance of 5 miles, is expected to be ready for traffic by September 15, 1915. There will be a station at Tokmon, 1 mile from Gensan, and at one other intermediate place. The reconstruction of the Seoul-Fusan line was begun on October 5, 1914, and is to be spread over five years, as is also the work on the Chongjin-Hoiryong Railway (58.6 miles), which was started during the same month. The total mileage of railways in operation in Corea is now 994 miles. During 1914 the following sections were opened: Seiyu to Koteiri on the Kōnan line, 35.5 miles; and Kenfutsuro to Kozan on the Keigen line, 23.8 miles; making a total of 59.3 miles newly opened to traffic. Surveying is in progress on the following lines, though it has not yet been decided when the work of laying them will be undertaken: (1) Taiku to Mokpo; (2) Hamheung to Chongjin; (3) Pingyang to Gensan; (4) a line running along the Yalu river.

Railway Construction

ALTON & SOUTHERN.—This company, which operates 11 miles of railroad as a belt line, plans to gradually extend the line around the territory near East St. Louis, Ill. Right of way has been bought for the construction of about four miles additional, but construction work has been delayed by a crossing controversy. The building of this extension in 1916 depends upon the result of the controversy.

ATHABASCA & FT. VERMILLION.—Reconnaissance reports have been made by the engineers on the projected route from Athabasca, Alta., northwest to Ft. Vermillion, about 300 miles. A charter to build over this route was granted last spring by the government of Alberta. Contingent on the completion of certain negotiations, the company hopes to begin construction work in the spring of 1916. Charles F. Law, Bank of British North American building, Vancouver, B. C., may be addressed (October 15, p. 714.)

BEULAVILLE RAILROAD.—Work is now under way by the Kinston Manufacturing Company, Kinston, N. C., on an extension from Beulaville, N. C., to Chinquapin, 7 miles. The company will also build one mile of secondary track between these two places.

CALIFORNIA ROADS.—The Board of Public Works of San Francisco has let a contract to F. Rolandi, 550 Montgomery street, for the construction of a railway from Rosasco, Tuolumne county, to the Hetch-Hetchy reservoir. The contract price is \$1,543,080. (November 5, p. 879.)

CANADIAN NORTHERN.—This company has grading work finished on about 140 miles on the Island of Vancouver, from Victoria to Alberni; also on 15.25 miles, from Victoria to Patricia Bay. Surveys are now being made from Kamloops, B. C., southeast via Vernon and Kelowna to Lumby, 141 miles, and on the Island of Vancouver, from Alberni to Nootka sound, 15.6 miles.

CLINTON & OKLAHOMA WESTERN.—Surveys are now being made for an extension to be built from Clinton, Okla., southeast to Colony, 30 miles. The company now operates a line from Clinton west to Strong City, 51 miles. (September 10, p. 487.)

CINCINNATI, HAMILTON & DAYTON.—Contracts were let during 1915 for the construction of 12 miles of second track from Carlisle, Ohio, to South Dayton. The estimated cost of the work is \$175,000. (October 29, p. 828.)

FLORIDA EAST COAST.—This company has authorized the construction of an extension of the Okeechobee division from Maytown, Fla., to a connection with the main line at New Smyrna, 17.35 miles, to cost about \$200,000. The contract for the grading work has been let to J. M. Cook, Jacksonville, Fla., and the bridge work and tracklaying will be carried out by company forces. The rail, ties and other track material have already been bought and are on hand. J. W. Wycoff is resident engineer for the construction work.

GULF COAST RAILWAY.—This company has been organized by some of the officers of the Southern Investment Company, Richmond, Va., to build a railway from a point near Venice, Fla., to Placida, about 28.5 miles. The promoters expect that construction work will be started in the near future. (November 19, p. 986.)

HOUSTON, RICHMOND & SAN ANTONIO INTERURBAN.—President Edward Kennedy, of Houston, Tex., is quoted as saying that a contract for grading the first 100 miles of this line will probably be let within the next 60 days. The projected route is from Houston west to San Antonio, about 215 miles. The general offices of the company are at San Antonio. (September 17, p. 547.)

LULA-HOMER.—Grading work is now under way between Belton, Ga., and Homer on 14 miles. William J. Redmond, Atlanta, Ga., is the general contractor. The company has projected an extension from Homer northeast to Anderson, S. C., 66 miles. D. G. Zeigler, chief engineer, Lula, Ga. (October 15, p. 714.)

NEW YORK SUBWAYS.—The New York Public Service Commission, First district, has approved the plans for the construction of the Webster avenue extension of the Third avenue

elevated railroad in the borough of the Bronx. This extension will extend from the present Third avenue line near its terminus north through Webster avenue to Gun Hill road, where a connection will be made with the new rapid transit line in White Plains road. This approval of the plans will enable the Interborough Rapid Transit Company to obtain bids immediately for the work.

The commission has awarded the following contracts on rapid transit lines in New York City: For the construction of Section No. 2 of Routes Nos. 19 and 22, to Lawrence C. Manuell, the lowest bidder, for \$2,063,877. This section is a three-track elevated railroad, and extends northerly from Whitlock avenue in the borough of the Bronx to Pelham Bay Park. For the installation of tracks on the White Plains road extension of the Lenox avenue branch of the existing subway, to the Coast & Lake Contracting Corporation, the lowest bidder, at \$53,930.

The commission has approved the award by the New York Municipal Railway Corporation to Bayly Hipkins of the contract for the erection of steel, constructing tracks, station buildings, platforms, etc., for the additional tracks on the Myrtle avenue elevated railroad in the borough of Brooklyn, between Wiloughby avenue and Palmetto street, and on Palmetto street, between Myrtle avenue and Cypress avenue. Mr. Hipkins was the lowest bidder, and offered to do the work for \$352,511.

NORTHERN OHIO TRACTION & LIGHT COMPANY.—This company during 1915 laid 3.50 miles of new first track in the cities of Akron, Ohio, and Canton, and 9.4 miles of double track cut-offs between Akron and Cleveland.

RICHMOND, RAPPAHANNOCK & NORTHERN.—A contract is reported let to the Central Construction Company, Harrisburg, Pa., for building from West Point, Va., northeast to Urbana, 17 miles. (December 10, p. 1113.)

SOUTHERN RAILWAY.—The additional main track under construction on this road, but not yet completed, is as follows: In Virginia, between Orange and Charlottesville, 28.1 miles; Arrowhead and Elma, 18.2 miles; Tye river and Amherst, 7.07 miles; Sycamore and Gretna, 5 miles; Whittles and Dry Fork, 9.7 miles. In North Carolina, between Concord and Rocky river, 5.6 miles. In South Carolina, between Hayne and Central, 55.85 miles, and in Georgia, between Cornelia and Gainesville, 24.7 miles, a total of 154.22 miles.

RAILWAY STRUCTURES

ASHLAND, WIS.—The two docks which are being extended by the Chicago & North Western are ore docks and not coaling docks, as reported last week. The Barnett & Record Company, of Minneapolis, Minn., has the general contract, and the contract for the ore chutes has been awarded the Wisconsin Bridge Company, of Milwaukee, Wis.

BALTIMORE, MD.—The Baltimore & Ohio is building a one-story addition, 30 ft. by 112 ft., at the Mount Clare shops, to cost about \$4,000. The work is being carried out by company forces.

GALLUP, N. M.—The Atchison, Topeka & Santa Fe has awarded a contract to Sharp & Gannon, Topeka, Kan., for changing the course of the Puerco river and filling in a site to be used for shops, roundhouses and tracks. The work will cost about \$67,000.

HOLLOW ROCK JUNCTION, TENN.—The Nashville, Chattanooga & St. Louis plans to enlarge its yards at Hollow Rock Junction and to increase the facilities at that place. The work of strengthening the bridges on the Nashville division has already begun between Nashville and Harding, also between Bellevue and Newson. Two bridges will be replaced with ballasted deck girders, and later it is proposed to reduce the grades on this division. The survey for this work has already been made.

LUDLOW, ILL.—The Central State Bridge Company of Indianapolis, Ind., has been awarded a contract for the construction of a 90-ft. span on the line of the Kankakee & Urbana Traction Company, north of Ludlow.

TAUNTON, MASS.—The superior court has filed a decree ordering the New York, New Haven & Hartford to complete the abolition of grade crossings in Taunton within three years and six months. President Elliott has testified that the work will cost \$2,500,000.

Railway Financial News

ARKANSAS, LOUISIANA & GULF.—See Arkansas & Louisiana Midland.

ARKANSAS & LOUISIANA MIDLAND.—This is the new name of the reorganized company which took over the Arkansas, Louisiana & Gulf.

ATLANTA, BIRMINGHAM & ATLANTIC.—Following the meeting of stockholders it was announced that an application will be made early in January to the secretary of state of Georgia for an amendment to the present charter as a first step toward reorganization.

CHICAGO, ROCK ISLAND & PACIFIC.—In an interview in the New York Times Charles A. Peabody, president of the Mutual Life Insurance Company of New York, and chairman of the protective committee for the first and refunding mortgage bonds, is quoted as saying: "My own impression is, and always has been, that a foreclosure under the first and refunding mortgage is inevitable. It must come sooner or later if the Chicago, Rock Island & Pacific is to be reorganized. I shall be glad, however, if some one else can show us a better way." N. L. Amster, who represents one of the minority factions of the stockholders, is quoted as saying: "The rumor of a foreclosure suit is only another attempt to throw confusion into the shareholders' camp. It is my view that there can be no foreclosure unless there has been an actual default of interest on the refunding bonds." The tentative plans which have been given out by the Amster interests suggest an assessment of \$33 per share on the stock. The Wall Street Journal says that application has been made to the trustees by the protective committee on behalf of holders of the first and refunding mortgage bonds for foreclosure of the mortgage. This step was taken under the clause of the mortgage prohibiting the placing of a lien on the property ahead of the refunding bonds. The violation of this provision, the committee claims, consists in the issuance of receiver's certificates.

MISSOURI, PACIFIC.—Frank J. Gould has authorized the deposit of his Missouri Pacific securities under the reorganization plan proposed by Kuhn, Loeb & Co. His holdings are not supposed to be very large, and it is not thought that this is any indication of how the Gould estate will act toward the plan.

WABASH-PITTSBURGH TERMINAL.—Representative Linthicum, of Maryland, has introduced in the lower house of Congress a resolution asking for an investigation of the Wabash-Pittsburgh Terminal.

WESTERN MARYLAND.—The directors have voted to pay interest on the coupons that have been in default on the company's notes. On January 1, therefore, there will be paid a year's interest on the coupons which were due January 1, 1915, and six months' interest on the coupons which were due July 1, 1915. These are coupons of the \$10,000,000 collateral trust notes and \$3,000,000 unsecured notes.

THE PROJECTED RAILWAYS IN GREECE.—The British consular report on the trade of the Piræus and district for the year 1914 says that the construction of the railway linking up the Piræus-Athens-Larissa line with the Oriental railways has made good progress, and according to a statement made by the minister of communications in the Greek Chamber of Deputies in Athens, the line will be ready in August, 1915. The necessary material—ties, rails, etc.—is being rapidly carried to the spot, while 20 engines and the rest of the rolling stock have been ordered in America, and will be delivered shortly. Owing to the war, several iron bridges which had been ordered in France cannot be ready in time, and in such a case temporary wooden bridges will be constructed where needed. A convention has also been signed for the purchase by the state of the old railway line. The purchase price agreed upon being \$2,600,000 less the dividend for 1913—about \$120,000—altogether \$2,480,000 as against \$3,996,000, the sum for which, according to the old convention, the Greek government was to have the right to take over the railway in 1927.